the OIL AND GAS JOURNAL

How sharp engineering dulled the cut of abrasive mud

Abrasive drilling mud is a bane as well as a boon to the industry. It has destroyed countless thousands of conventional valves in mud line service, yet it is an essential aid to drilling.

In 1938, Cameron engineers, with long experience in resilient pack-offs and seals for blowout preventers and master valves, tackled the mud line valve problem. The result was the Flex-Seal Valve with renewable flow-way insert to absorb the cutting action. The rest is history. When rig operators learned that they could drill four to five times as much footage with Flex-Seal Valves and then repair them at the rig at small cost by simply replacing the rubber flow-way insert . . . that did it! A blow to the valve repair business, perhaps, but a blessing to the operators.

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PRICE 50 CENTS TABLE OF CONTENTS ON PAGE 1 **MARCH 16, 1953**

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If you take this map and compare it with a map of the country's oil producing areas, you'll see at once that practically every active field is only minutes away from one of Lane-Wells 72 branches. And each of these branches is ready, round the clock, to provide operators on-the-spot on-the-dot service with up-to-date equipment operated by thoroughly trained and experienced men who know local conditions. That fast, dependable service is one reason why operators agree that you get *better* perforating when Lane-Wells does the job.

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the OIL AND GAS JOURNAL

MARCH 16, 1953 VOL. 51 NO. 45

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In Brief...

1. PROCESS MONITORING . . . Instrumentation developments in the next decade will not be directed toward the automatic plant, but will be directed toward extending the scope and increasing the efficiency of the human operator. Better monitoring of process variables is one means to this end. Better monitoring is being obtained in three ways: (1) through use of graphic panel boards and miniturization of instruments, (2) by using annunciator systems as operating guides, and (3) by increasing the utility of automatic scanning systems.

•

2. PACKAGED GASOLINE PLANT is the answer to an industry need. It makes available processing equipment that can be used economically in small or lean-gas fields. The plant should be semiportable; it should be flexible in design to permit its use under different field conditions; and it should be completely automatic, requiring only intermittent attention by an operator. The units can be skid mounted and shop fabricated, with only the columns and interconnecting piping requiring field installation crews.

•

3. TRAILER-MOUNTED WORKOVER RIG can be rigged up or torn down in approximately 4 hours. Two trailers are used to support mast and draw works and to transport them. The unit has a high degree of mobility, with only four loads being involved in a move: (1) and (2) trailers; (3) mud pumps and generator; and (4) swivel, kelly, stair steps, pipe rack, A-frames, and miscellaneous.

•

4. PACKAGE T.C.C. UNIT . . . Throughput of the Vickers Petroleum Co. refinery at Potwin, Kans., has been increased to 12,000 bbl. per day, with installation of new T.C.C. unit. This package unit has a nominal fresh feed capacity of 4,000 bbl. per stream day of gas oil, plus 2,500 bbl. per stream day of recycle oil, when operating at approximately 75 per cent conversion level.

•

5. NEW LUBE-OIL DEVELOPMENTS . . . Deasphalting, extraction, and dewaxing operations are affected by the front-end distillation and the degree of stripping of the residuum fraction produced in the vacuum-distillation operation. Some of the important operating aspects in solvent refining include: (1) purity of propane solvent in deasphalting operations, (2) control of temperature gradient in phenol extraction, and (3) prevention of oil separation in MEK-toluene dewaxing.

GREATER RESISTANCE TO CORROSION AND MECHANICAL DAMAGE...

with the HARTZELL COOLING TOWER FAN

HARTZELL pioneered giant-sized cooling tower fans with Hartzite blades for the petroleum industry. The complete success with which they have operated over a period of years proves their dependability.

Large Hartzell blades are made of Hartzite (reinforced plastic). Hartzite resists corrosion unusually well; it absorbs vibration and is not notch conscious; if its surface is damaged the exposed interior has the same corrosion and damage resistance.

Hubs are many times stronger than required.

All Hartzell cooling tower blades are adjustable-pitch. You can change air-delivery to suit changed needs. All steel hubs are dynamically balanced and all blades are balanced against a master blade.

Those are some of the reasons why Hartzell cooling tower fans have "taken the petroleum industry by storm." More and more, specifications are written simply: "Hartzell fan." There is no equivalent.

Mail the coupon below for complete information, or write for our Cooling Tower Bulletin 1501.

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Only B. F. Goodrich rotary drilling hose has all these features

Stronger, more flexible, longer lasting, with exclusive Permalock coupling

Here's a hose that can drill under high rock and gas pressures, that your crew can treat rough, that will keep your rig on the job with a minimum of hose trouble.

Extra strength for deep drilling

Two spiral-wrapped plies of high tensile cable wire, plus eight plies of sturdy fabric give B.F.Goodrich Highflex hose extra strength for extreme bottom hole pressures. Qualifies for Grade C (5000 lb. test pressure) American Petroleum Institute. As an extra protection against bending stress at the coupling, hose ends are reinforced with additional layers of wire and fabric. This extra strength means no hose "blowouts"—added safety for your crew and rig.

Flexible, easy to handle

For all its toughness, this hose is still the most flexible one made for heavy-duty service. It's easy to attach to the rig, to move from one well to another, and it coils without kinking or "snaking".

Abrasion-resistant, tough cover

Because it's made of the highest grade, abrasion-resisting rubber, the cover on Highflex hose has strength to spare even when handling is rough. Its thick, tough cover resists gouges, scrapes, tears. Year round exposure to sun, wind, and rain will not harm it.

Oil won't rot tube

Oil in the mud will not cause swelling or rotting of tube. Also abrasion resisting.

Saves waiting

B. F. Goodrich Highflex rotary drilling hose with exclusive Permalock couplings is available at leading supply houses in the major drilling areas. However, should your local supplier be temporarily out of stock when you call, you can get the BFG hose you need any time—day or night—from one of these B. F. Goodrich warehouses: Dallas, Houston, Kilgore, Odessa, Witchita Falls, Oklahoma City, Tulsa, Williston, Denver, and Los Angeles. *The B. F. Goodrich Company, Industrial & General Products Division, Akron, Ohio.*

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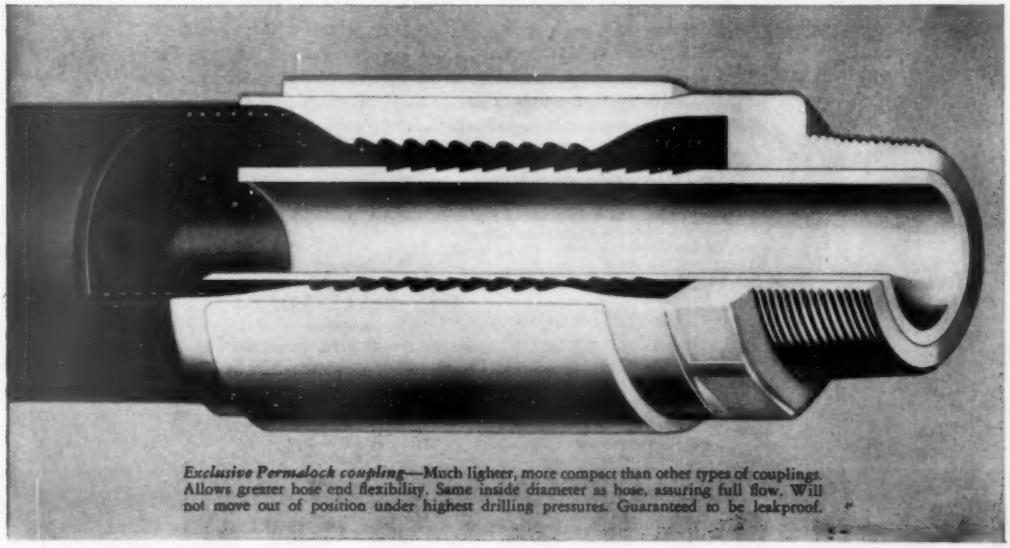

Exclusive Permalock coupling—Much lighter, more compact than other types of couplings. Allows greater hose end flexibility. Same inside diameter as hose, assuring full flow. Will not move out of position under highest drilling pressures. Guaranteed to be leakproof.

Here's why more and more "problem wells" are pumped with Neilsen TOP-QUALITY "Di-Hard" pumps

"DI-HARD" Stationary Sectional-Liner Barrel Rod Pump with cup-type bottom hold-down, and streamlined fittings.

"DI-HARD" Tubing Pump with "Locked Liner" and "Skirt-type Plunger"; equipped with gas valve and cup-type standing valve of advanced streamlined design and illustrating the Reed puller.

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LINERS AND PLUNGERS . . . are factory mated. Sectional liner barrels are first assembled, then finish honed. Neilsen's exclusive "Locked-Liner" construction is used in 1½" rod pump and 1¾" tubing pump sizes and larger. Composite type plungers are assembled and ground. "Skirt-Type" plungers, in which the "DI-HARD" material is relieved of both assembly and working stresses, are available for pumps of 1½" bore and larger.

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BARRELS CAN BE REHONED . . . and plungers reground. That is why these pumps are sold on a money-saving exchange basis.

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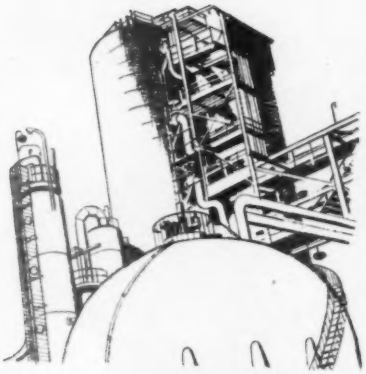
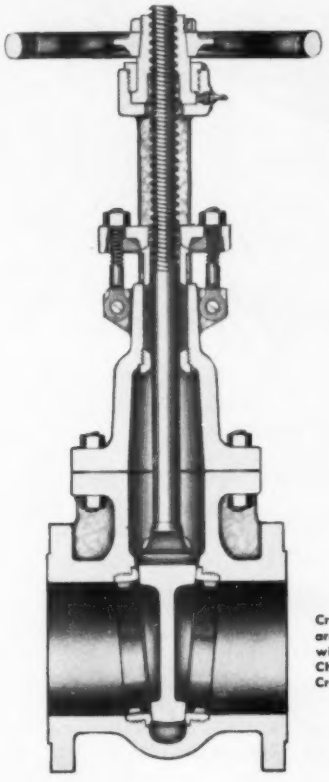


Workhorse of the Oil Industry

CRANE 150-POUND STEEL GATE VALVES



In every industry there's one outstanding valve that bears the brunt of service. In petroleum, it's the 150-pound cast steel wedge gate. As a pioneer in its development, Crane is proud to have helped set the high quality standards of modern steel valve design.

Take Crane *Exelloy*—"X" trim—for example. In the early days of oil refining, many metals and metal combinations were tried for seating surfaces and found wanting. Crane *Exelloy*, adopted more than 25 years ago, set a new record of usefulness and satisfaction. So remarkable was its performance that this class of material (roughly designated as 11½ to 13 per cent chrome) became the recognized staple valve trim in the petroleum industry.

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It's you, the Thrifty Valve Buyer, who benefits from Crane Co.'s steady pioneering in better valve design. You get bigger value through longer-lasting service and lower maintenance cost. And you get it in every Crane valve.

Crane 150-Pound Cast Steel Gate Valves are available in a complete range of sizes with screwed, flanged, or welding ends. Check your Crane Catalog—or ask your Crane Representative for full information.

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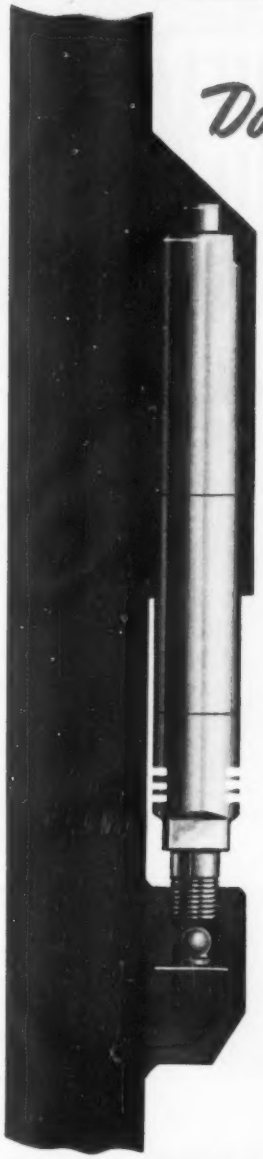

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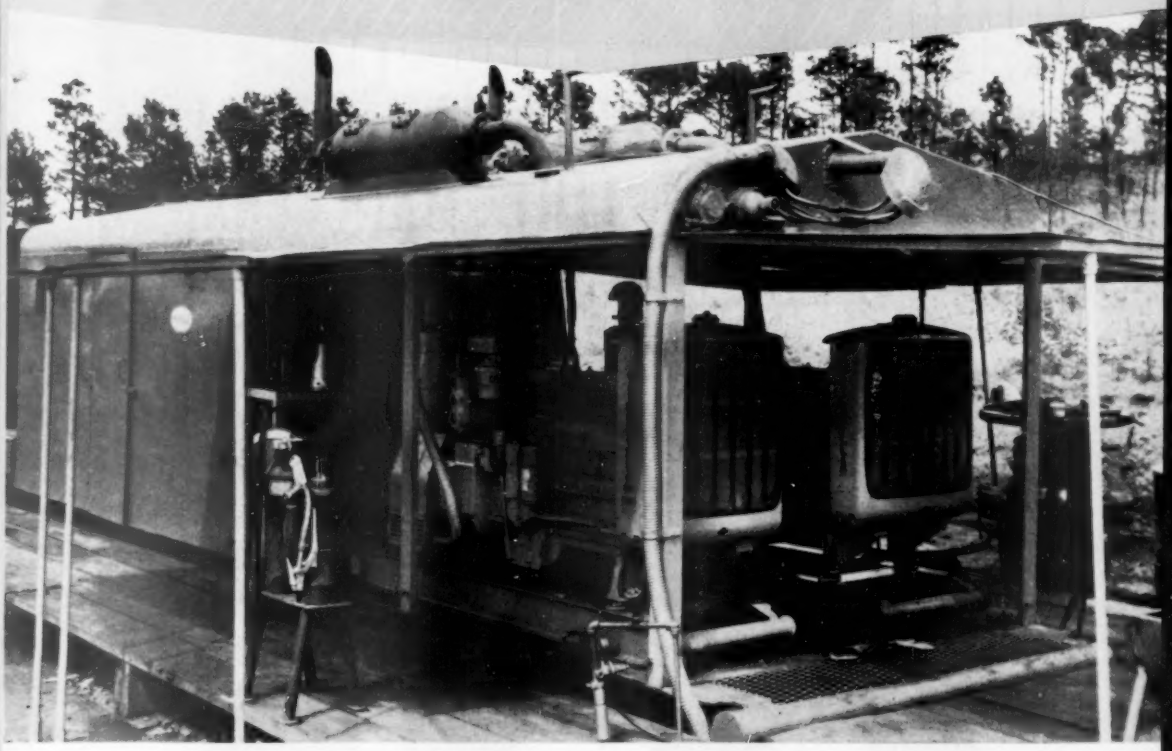
CAT Electric Sets make good at Cusseta Wildcat



On the Cusseta Wildcat, in Cass County, Texas, a major oil company has been using Caterpillar Diesel Electric Sets for electric power around the rig.

A pair of Cat D318s, shown above in the dog house, generate power to drive two mud stirrers, mud mixer, two water pumps, steamer, shale shaker, blowout preventer, compressor, air compressor blower, lights and dynamatic brake. Each unit has a rated output of 60 KW, and they can be run alternately or both at once, as loads require.

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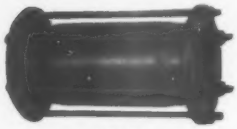

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For fast connections and repairs, use time-proved Dresser Couplings and Long Sleeves. Ideal for replacing damaged sections of pipe and for tie-ins. Quick and easy assembly—permanently tight. Complete size range.

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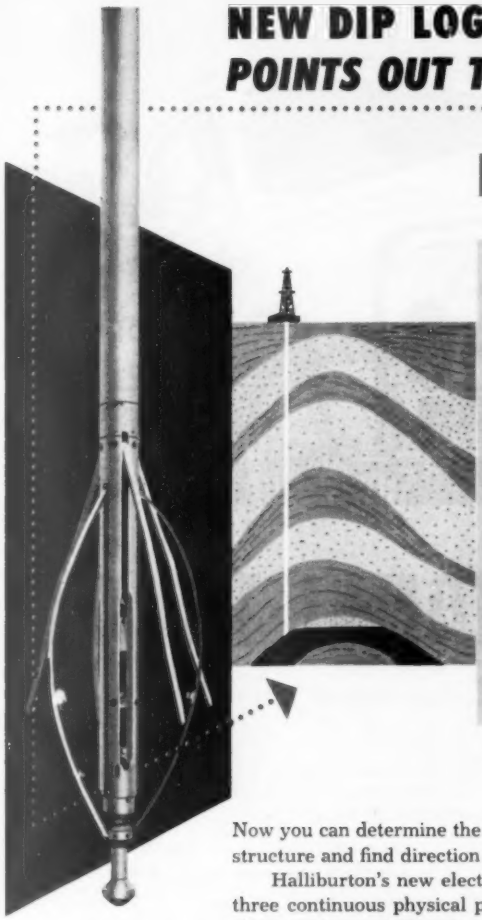
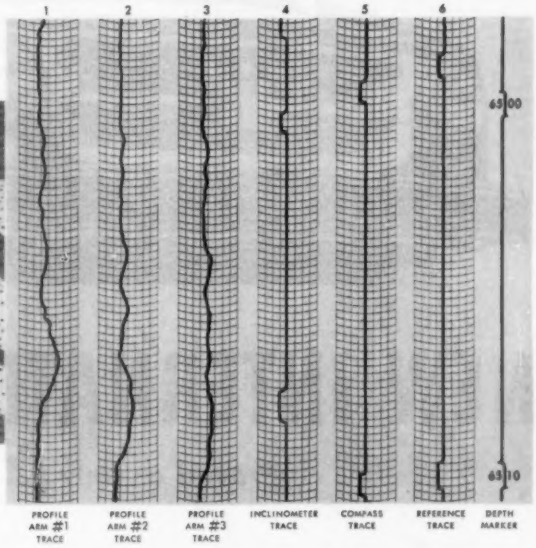


HALLIBURTON'S DIP LOG



Now you can determine the dip of subsurface formations – locate test wells higher on structure and find direction to develop the reservoir if the test is productive.

Halliburton's new electronic well logging device, the Dip Log, accurately traces three continuous physical profiles of subsurface erosion. From these measurements of inclination and direction the dip and strike of the formation can be calculated.

Three profiling arms, spaced 120 degrees apart in azimuth, transmit a continuous message from which dip may be calculated. The logs are run approximately 50 feet per minute on a depth scale of 1 inch of record to 1 foot of hole. The sensitivity of the lateral scale of the profiling arms can be changed at will by a surface sensitivity control, allowing measurement of a wide range of hole diameter – from 6¾" to 30".

The accuracy of determining dips depends not only on the measuring instrument but on proper interpretation of results. Halliburton-trained specialists know the capabilities of their Dip Log. And their careful, considered correlation of information provided by the Dip Log helps you to move confidently "up-structure."

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IH scores again...

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Now—the features you want—in America's most complete truck line

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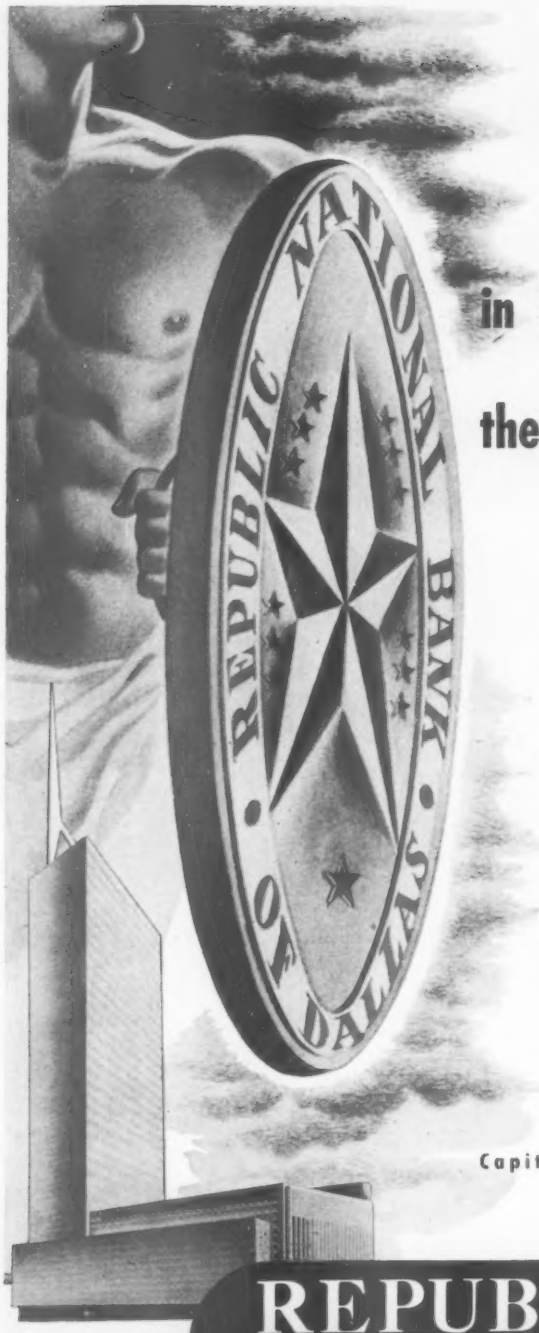


in STRENGTH there is SERVICE

Oil production requires strength — in men, materials . . . and financing. At Republic National of Dallas, the strongest capital structure in southern banking means broader, better service to the Southwest's leading industry.

Capital and Surplus $42,500,000.00
Largest in the South

REPUBLIC NATIONAL BANK OF DALLAS

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

IN THE PETROLEUM INDUSTRY

There's more to CORROSION than meets the eye

Sometimes VISIBLE...Often HIDDEN...Corrosion Strikes Everywhere

This year, the Petroleum Industry will pay millions of dollars for needless losses created by corrosion... *yet much of this corrosion may never be discovered* until it's too late to protect—and time to pay!

Corrosion is readily detected when it appears as rust layers or failing paint on exposed surfaces. But, by far, the major costs of corrosion come from hidden areas—where only minute inspections and constant care can prevent costly failures.

YOU LOSE IN A "WAITING GAME"

Don't wait for rust or other visible signs to appear. Visible or hidden, corrosion will destroy costly equipment... halt production... cause unnecessary maintenance shutdowns... and contaminate valuable products. Thus, corrosion dips deep into your profits as it creates needless losses totaling thousands of dollars.

YOU CAN PREVENT NEEDLESS WASTE

Check your tanks, piping and equipment for corrosion's presence. Double-check areas that are vulnerable to *hidden corrosion*. If you would like help, an AMERCOAT Field Engineer will gladly assist you in making a thorough analysis. There is no obligation.

What is AMERCOAT?

AMERCOAT is a method of corrosion control. Not just a single product, but a complete LINE of coatings, individually formulated to solve or control specific industrial corrosion problems.

FOLLOW THE LINE OF least RESISTANCE... PROTECT WITH Amercoat!

AMERCOAT CORPORATION

4809 FIRESTONE BLVD., SOUTH GATE, CALIFORNIA

CHICAGO, ILL. NEWARK, N. J. JACKSONVILLE, FLA. DALLAS, TEX.

For Features that Mean Long Valve Life and Low Cost Service Get this ALL-Purpose Edward Forged Steel Globe Valve

Edward Fig. 444-448 series, built in sizes ¼ to 2 in. inclusive . . . forged steel globe and angle . . . 600 and 1500 lb sp . . . bolted or union bonnet . . . screwed or socket welding ends . . . Fig. 448 illustrated.

CHECK THESE Big FEATURES

- ✓ Hard bronze yoke bushing to prevent stem seizing or galling . . . lock welded to yoke
- ✓ Packing is Edward EValpak . . . heat resistant, water-proofed and die molded for long service
- ✓ Disk of EValloy 13% chromium or Stellite . . . slotted or disk nut type . . . self centering
- ✓ Tight, easily accessible bolted or union bonnet joint . . . with Ironkote gasket of 90 Brinnel max. hardness for leak-proof joint
- ✓ Heat treated forged steel inclined stem globe type body for lowest pressure loss
- ✓ Built-in pressure-tight backseat . . . permits repacking under pressure
- ✓ Roomy forged yoke . . . plenty of finger space for repacking
- ✓ Strong forged gland bolts . . . plated for long thread life

Edward Valves, Inc.
1492 West 145th Street, East Chicago, Indiana

Please send literature covering your Fig. 444-B series all-purpose forged steel valves.

Name_____

Company_____

Position_____

Address_____

City_____ Zone____ State_____

Edward Valves, Inc.

Subsidiary of ROCKWELL MANUFACTURING COMPANY

EAST CHICAGO, INDIANA

RIGHT AT THE BEGINNING—

Plan on using Bitumastic® Enamel to protect your pipe line against corrosion

ANY pipe line, whether large or small, is an important investment — an investment that should be properly protected.

That's why it's wise, when planning a new pipe line, to include Bitumastic Enamel in your designs, plans and specifications. Bitumastic Enamels, manufactured from selected coal-tars have proved they can prevent corrosion. Many oil and gas pipe lines, that were coated with Bitumastic Enamel and laid 20 and 30 years ago, are still giving good service today.

Why not let your Koppers representative work with you from right at the beginning through final operations? He will be glad to assist you in getting the most out of your protection dollar.

KOPPERS BITUMASTIC ENAMELS

REG. U.S. PAT. OFF.

KOPPERS COMPANY, INC., Tar Products Division, Dept. 303-T, Pittsburgh 19, Pa.

DISTRICT OFFICES: BOSTON, CHICAGO, LOS ANGELES, NEW YORK, PITTSBURGH, AND WOODWARD, ALA.

Who originated Controlled Directional Drilling Service?

H. John Eastman's new method of controlled directional drilling made history in 1933. Then, for the first time this new technique was used in drilling a relief well to conquer the wild Alexander #1 at Conroe, Texas. Ever since, Eastman and directional drilling have been synonymous.

Eastman SERVICES

Can Help Solve Your Drilling Problems

Multiple Wells from artificial island.

Shore-line drilling to a sub-marine location.

Inaccessible location.

Drilling beneath cap of salt dome.

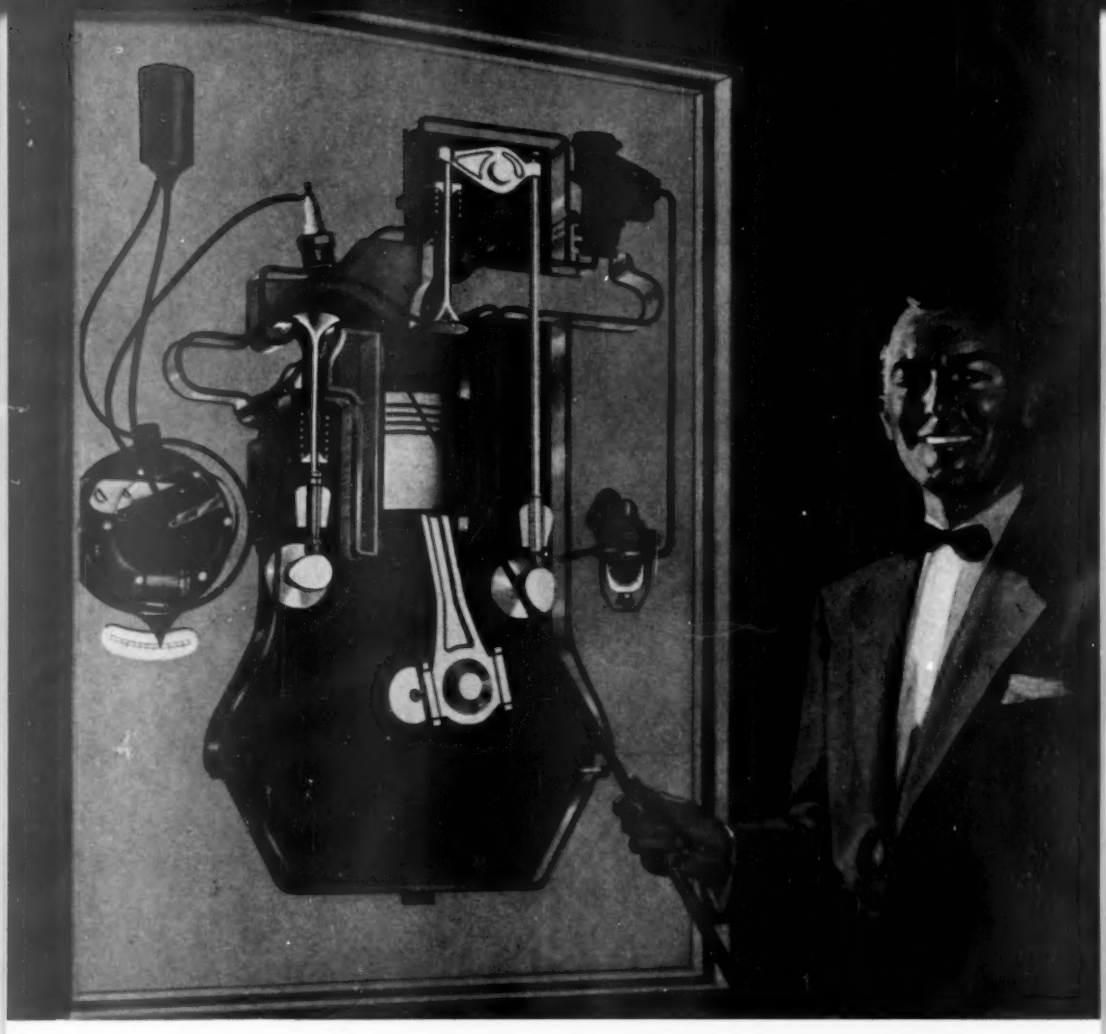
Eastman Experienced Engineers, Advanced-Design Tools and Field-Proved Instruments are Available for Immediate Service.

Originators of Controlled Directional Drilling Service
Pioneers of Oil-Well Surveying

EASTMAN OIL WELL SURVEY COMPANY
LONG BEACH DENVER HOUSTON

Export Sales and Service:
EASTMAN INTERNATIONAL COMPANY
P. O. Box 1500 Denver, Colorado

22 Offices
For your convenience consult your telephone directory



How to tune up a service station salesman

Today, it takes more than a snappy uniform to make a good service station salesman. He must know his business.

And knowing his business means a good working knowledge of automobile engines, fuels, lubricants, and TBA items. This is the kind of knowledge that helps him do a better selling job.

That's why Ethyl developed the Product Sales Clinic—a special service station training program that fits right into your own training plans. It is designed to give your dealers and salespeople the down-to-earth facts they need.

Judging by results, it has proved to be one of Ethyl's most valuable services. In the past year alone, we put on 612 request showings of the Product Sales Clinic. More than 50,000 service station salesmen attended.

(Continued on next page)

Printed in U.S.A.

How to tune up a service station salesman

(*Continued from preceding page*)

Since the program began, more than 150 oil companies have sent their dealers and marketing people to the Clinic to learn more about the products they sell. Every oil company that has scheduled the Product Sales Clinic is enthusiastic. Here are two typical statements:

> ***". . . comments from numerous people attending these (Ethyl) shows were conclusive proof that we can expect increased sales, not only of our gasoline and oil, but of our TBA items as well."***
>
> ***". . . the program you put on was one of the finest I have ever seen, and I hope many more of our people may see this very same thing."***

Experiences like this throughout the country make us feel that even your best salesmen can do a better job with the benefit of an occasional "tune-up." Ask your Ethyl representative about scheduling the Product Sales Clinic in your territory.

ETHYL CORPORATION
NEW YORK 17, NEW YORK

Ethyl service is backed by 30 years of antiknock experience

RESEARCH

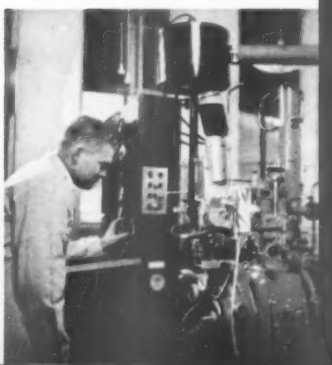
FARM SERVICE

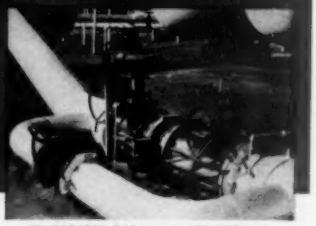
SAFETY SERVICE

SALES HELPS

ROAD TESTING

GASOLINE TESTING

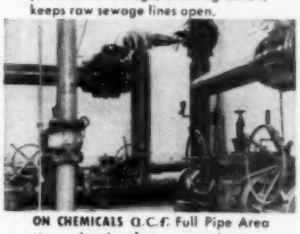




ON NATURAL GAS a.c.f. **CYLINDRICAL** Plug Valves have no obstruction to flow, quick quarter-turn shut-off.

This a.c.f. Full Round Port **CYLINDRICAL PLUG VALVE**—with all its sound, true economy features—is made especially for critical installations where uninterrupted, fast flow is a necessity. a.c.f. Round Port Valves are available in sizes up to 12 inches. a.c.f. Rectangular Port Valves also offer full pipe area. *And here's a new, added feature!* a.c.f. Valves are now available with **TEFLON** head gaskets, for easier turning, greater protection against leakage on difficult services. When next you specify, why accept less—ask for a.c.f.

IN SEWAGE PLANTS the a.c.f. Valve provides knife-edge, shearing action, keeps raw sewage lines open.



ON CHEMICALS a.c.f. Full Pipe Area stops abrasion from suspensions, no contamination of ladings.

a.c.f. CYLINDRICAL FULL PIPE AREA PLUG VALVES

Write for Catalogue 4-OG, American Car and Foundry Co., Valve Division, 1501 E. Ferry Ave., Detroit 11, Mich.

Representatives in 50 Principal Cities

Compare-

STURDYBILT with ANY Type of Field Housing

Look What STURDYBILT Gives You!

- **DESIGN**
  That "custom-built" look and expensive house comfort.
- **PORTABILITY**
  Moved to your site . . . erected in days instead of weeks.
- **DEMOUNTABILITY**
  Take houses with you when you move. Practically no loss of material.

MANUFACTURERS OF SPECIAL MILLWORK; DISTRIBUTORS OF JOHNS-MANVILLE BUILDING MATERIALS; CURTIS WOODWORK.

When you need field housing you need it quickly. You also want low cost housing that is attractive to workers' families and comfortable for year 'round living.

STURDYBILT gives you these features *plus* portability.

When you buy oil field housing compare any other type of housing with the STURDYBILT plan. You'll find you can't beat STURDYBILT for speed of erection . . . durability . . . portability . . . attractiveness or comfort.

STURDYBILT PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. • TULSA, OKLAHOMA

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

Here is a magneto that controls explosive fumes with "flame-proof" ventilation. The special ventilating arrangement of the Bendix Low-Tension Magneto permits air laden with explosive fumes to enter the magneto for ventilation without danger of igniting the surrounding air. Kits are also available to convert magnetos now in use to the "flame-proof" ventilation type.

In addition to this important safety feature Bendix Low-Tension Magnetos actually reduce engine maintenance and operating costs. For example, spark plug erosion is reduced to a minimum. The distribution of low tension voltage to the high tension coils is through a series of breaker assemblies, thus eliminating trouble often experienced with the conventional distributor. Variable or fixed sparks can be obtained by internal adjustment.

For safety and low operating costs it will pay you to specify Bendix Low-Tension for all your magneto requirements. Complete data available on request.

- **Low Plug Erosion Rate**
- **Breaker Type Distributor**
- **Ventilation without Fire Hazard**
- **Radio Shielding Available**
- **Variable or Fixed Ignition**

Bendix

SCINTILLA MAGNETO DIVISION OF
SIDNEY, NEW YORK

Bendix
AVIATION CORPORATION

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, New York

FACTORY BRANCH OFFICES:

117 E. Providencia Avenue, Burbank, California • Stephenson Building, 6560 Cass Avenue, Detroit 2, Michigan
Brouwer Building, 176 W. Wisconsin Avenue, Milwaukee, Wisconsin • 582 Market Street, San Francisco 4, California

NEW HORSEPOWER!
NEW BRAKING POWER!
NEW EARNING POWER!

Biggest truck values of the year! New, just-announced Dodge trucks with features like . . .

7 high-compression engines, with 100 to 171 horsepower, give you more ton-miles per hour, more deliveries per day! New styling inside and out, tough new floors in pick-up and panel bodies, new tighter-than-ever tailgates on pick-ups and expresses! A total of more than 50 brand-new features to boost truck earning power!

More, you get such famous Dodge extra values as lightweight aluminum-alloy pistons, rivetless Cyclebond brake linings on all hydraulic brakes, moistureproof ignition, shot-peened rear axle shafts! Get more truck for your money . . . see your neighborly Dodge dealer!

NEW!

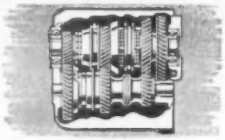
MORE POWERFUL ENGINES!

7 high-horsepower engines! 3 brand-new, with increased displacement, greater cooling capacity, twin carburetion available on larger trucks!

NEW!

BETTER BRAKING!

Super-safe brakes stop smoothly, easily, with less pedal pressure! New increased stopping ability on 1- thru 2½-ton trucks!



NEW!

NO GEAR-SHIFTING!

Truck-o-matic transmission with gyrol Fluid Drive available on ½- and ¾-ton models! Saves shifting, yet lets you rock out of snow, mud!

NEW!

OVER 50 FEATURES!

Reinforced cab construction, larger exhaust system, new 116″ wheelbase ½-ton pick-up! Dodge-Tint glass, higher output heaters available!

There's one to fit your job . . . ½-ton through 4-ton. See your friendly Dodge dealer.

DODGE "Job-Rated" TRUCKS

Hook block makes light of heavy loads –travels easily on TIMKEN® bearings

THIS Ideal Hook Block travels easier under heavy loads, falls faster when empty, because its sheaves are mounted on Timken® tapered roller bearings.

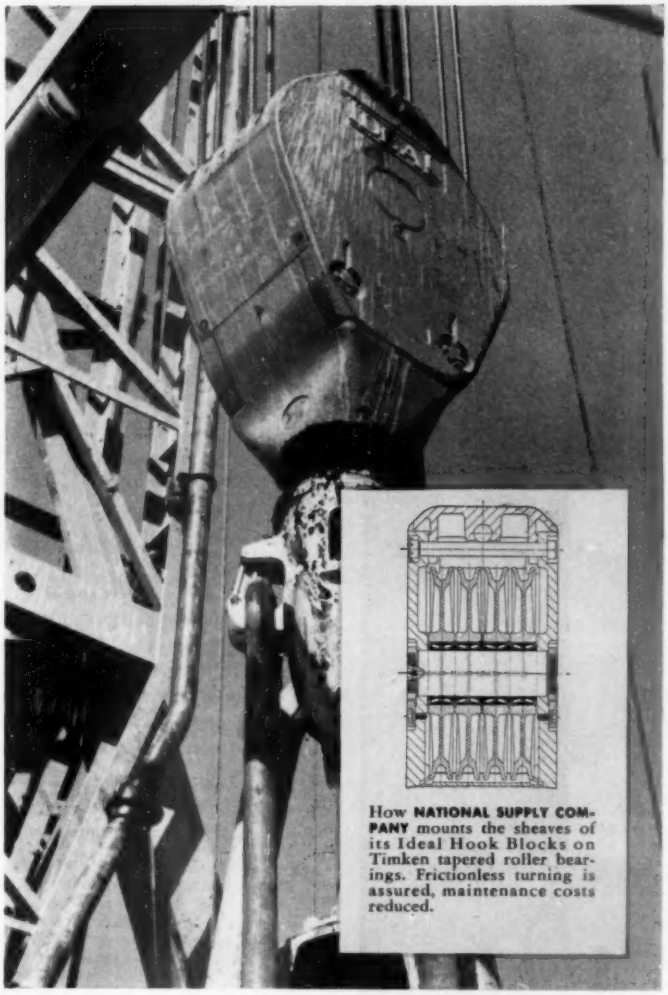
Line contact between rollers and races gives Timken bearings the extra load-carrying capacity called for in Hook Block sheaves.

The true rolling motion and incredibly smooth surface finish of Timken bearings virtually eliminate friction. Sheaves turn freely, easily. Cable scuffing is eliminated.

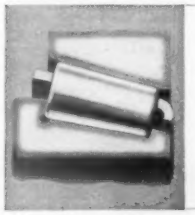
Because Timken bearings are tapered, they take radial and thrust loads in any combination, keep sheaves in accurate alignment. Timken bearings carry the shock loads of the drilling string because they are case-hardened to give tough, shock resistant cores and hard, wear-resistant surfaces.

Your machinery will give you longer, more dependable service with Timken bearings. Be sure to specify them and look for the trade-mark "Timken" stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **NATIONAL SUPPLY COMPANY** mounts the sheaves of its Ideal Hook Blocks on Timken tapered roller bearings. Frictionless turning is assured, maintenance costs reduced.



GREATER LOAD AREA

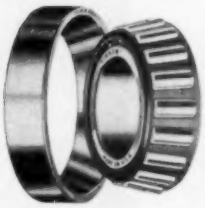
Because the load is carried on the *line* of contact between rollers and races, Timken bearings carry greater loads, hold shafts in line, wear longer.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

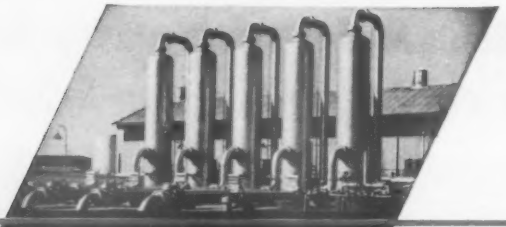
TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◎ AND THRUST → ◎ ← LOADS OR ANY COMBINATION →✳←



No Slugging of Compressors ... *with* **FLUOR** *Gas Cleaners*

On guard!

This is the Fluor Model DV Gas Cleaner, an oil-injection type scrubber for removing dust from dirt-laden gas. It is known for its superb cleaning efficiency, non-slugging characteristics, rugged qualities, and its fine balance between the oil-injection rate and the extraction ability of the elements and "drop out" areas.

The dust particles in gas passing through a Venturi-type oil spray chamber are thoroughly wetted, regardless of the quantity, pressure and temperature of the gas in the line. There are no moving parts or special mechanisms — the rate of flow of gas through the cleaner automatically determines the quantity of oil that is aspirated with the gas. Because of the variations in suction pressure common to gas transmission service, the gas cleaner is designed to operate through a broad pressure range at full capacity.

Three expansion areas and two mist-extracting elements remove the remaining liquid so effectively that Fluor guarantees a carry-over not to exceed .05 gallon per million standard cubic feet of gas. Reliable tests on a well-known gas line found carry-over of Fluor DV Gas Cleaners less than .01 gal./mmscf.

FLUOR LIQUID REMOVAL GAS CLEANERS

Utilizing the same principles as Model DV, Fluor liquid removal Gas Cleaners possess an exceptional ability to extract liquids through the whole range of operating conditions. Performance of these cleaners is accurately predicted on special nomographs, a new rating system exclusive with Fluor. For full details contact your nearest Fluor office or write for Bulletin GC-0.001.

BE SURE WITH **FLUOR**

THE FLUOR CORPORATION, LTD.
LOS ANGELES 22, CALIFORNIA

FOREIGN: FACTS-FLUOR-PARIS
FLUOR OF CANADA-TORONTO
FLUOR INTERNATIONAL-BEIRUT
HEAD WRIGHTSON-LONDON

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NEW YORK
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SAN FRANCISCO
HOUSTON
BIRMINGHAM
TULSA

Fire Fighter here discharges FogFOAM onto burning gasoline through 2½" FFF Nozzle.

FogFOAM *puts smothering blanket over flaming liquids*

Rockwood Nozzle Turns out Perfect Proportions of Foam, Air and Water to put out highly volatile flammable liquids; action is instant

Just 3 parts of Rockwood Double Strength Foam added to 97 parts of water, and you've a special "mix" that's death to fire.

It does its job through a special Rockwood FogFOAM nozzle that turns it into smothering FogFOAM. You get far greater fire fighting extinguishing action than ever possible with old style chemical or mechanical foam equipment.

Tank-truck and airplane crash fires — fires aboard ocean going tankers — fires in refineries and industrial plants — are quickly and effectively smothered.

What's more, Rockwood Double Strength FOAM is faster spreading, flows freely at sub-zero temperatures, will not corrode and can be easily washed away after fire is extinguished.

Rockwood proportioning systems automatically control ratio of FOAM liquid to water ensuring proper proportioning regardless of number of nozzles used. They can be custom engineered to your requirements.

Plan now to have a Rockwood Engineer recommend the right fire fighting equipment to meet your needs. Mail coupon below.

ROCKWOOD **ROCKWOOD SPRINKLER COMPANY**

Engineers Water* . . . *to Cut Fire Losses

Rockwood Type FFF FogFOAM Nozzle with FogFOAM Screen available for service on 1½", 2½", 3½" fire hose lines. Nozzles discharge Solid FOAM (with shaper), and High Velocity WaterFOG as well as FogFOAM (with screen). Range of FogFOAM with shaper approximately 60 feet, with screen 30 feet.

Fleet of Tankers is equipped with FFF Nozzles and proportioning system. Shown here, FogFOAM being discharged on deck and water during test. Ships must be protected from spill fires on water as well as aboard ship.

Rockwood Double Strength Foam — available in 5 gallon cans or 50 gallon drums. Tested by Underwriters' Laboratories.

SEND FOR THIS ILLUSTRATED CATALOG

ROCKWOOD SPRINKLER COMPANY
104 HARLOW STREET
WORCESTER 5, MASS.

Please send me Rockwood's illustrated catalog on the complete line of cost cutting, efficiency-boosting products for modern fire fighting.

Name.....

Title.....

Company.....

Street.....

City.....

Zone.....State.....

In catalytic reforming

It's the **CATALYST**

That's why you should know the story behind the catalyst used in

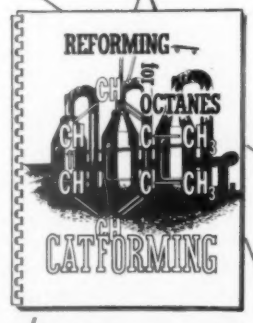
CATFORMING

THAT COUNTS

Many years have gone by since catalytic reforming was first utilized by the petroleum industry. As with many developments, earlier methods fell far short of ideal.

Many years ago Atlantic's engineers and chemists looked well ahead to the more demanding needs of industry-wide commercial application. They devoted themselves to continuous and unrelenting laboratory research. One catalyst after another was rejected for failing to meet Atlantic's projected ideal catalyst. Finally, a catalyst possessing new characteristics and demonstrating an ability to surmount the shortcomings of previously developed catalysts was found. This completely new catalyst, combining the advantages of improved selectivity, greater stability, excellent resistance to poisoning, and easier regeneration, is the heart of CATFORMING.

CATFORMING is now in successful commercial operation, furnishing positive proof that IT'S THE CATALYST THAT COUNTS. You are invited to share the many benefits of CATFORMING by joining our ever-growing list of licensees. Call or write for our new detailed bulletin for your introduction to CATFORMING. The Atlantic Refining Company, Research and Development Department, P. O. Box 8138, Philadelphia 1, Pa. (Telephone, Howard 5-2345.)



This detailed bulletin yours for the asking!

ATLANTIC

SYDNEY SMITH & SONS (Nottingham) LTD.

BASFORD WORKS, NOTTINGHAM, ENGLAND

Telephone: Nottingham 75031/2/3

MOVEMENT
Heavy Duty Type with wide Bronze Quadrant

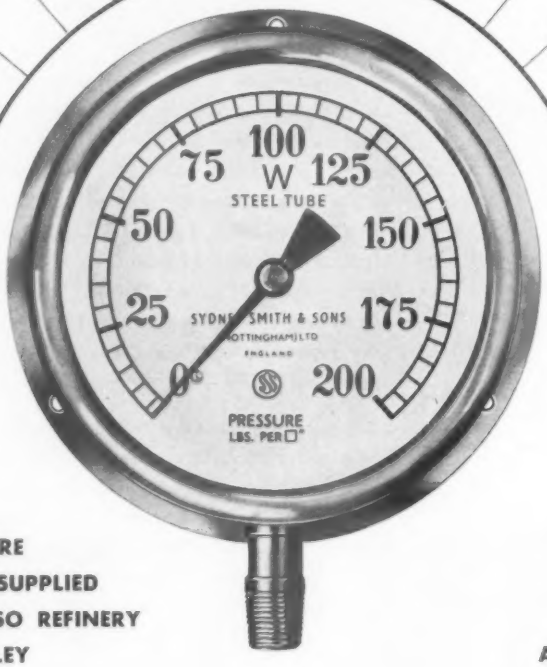
CASE
Weatherproof Cast Iron Brass or Aluminum Screwed Bezel and Rubber Blow-out Disc

TUBE
Brazed Phosphor Bronze Welded Alloy Steel or Welded Stainless Steel

CONNECTION
¼", ⅜" or ½" Thread with Spanner Flats

POINTER
With Micrometer Adjustment

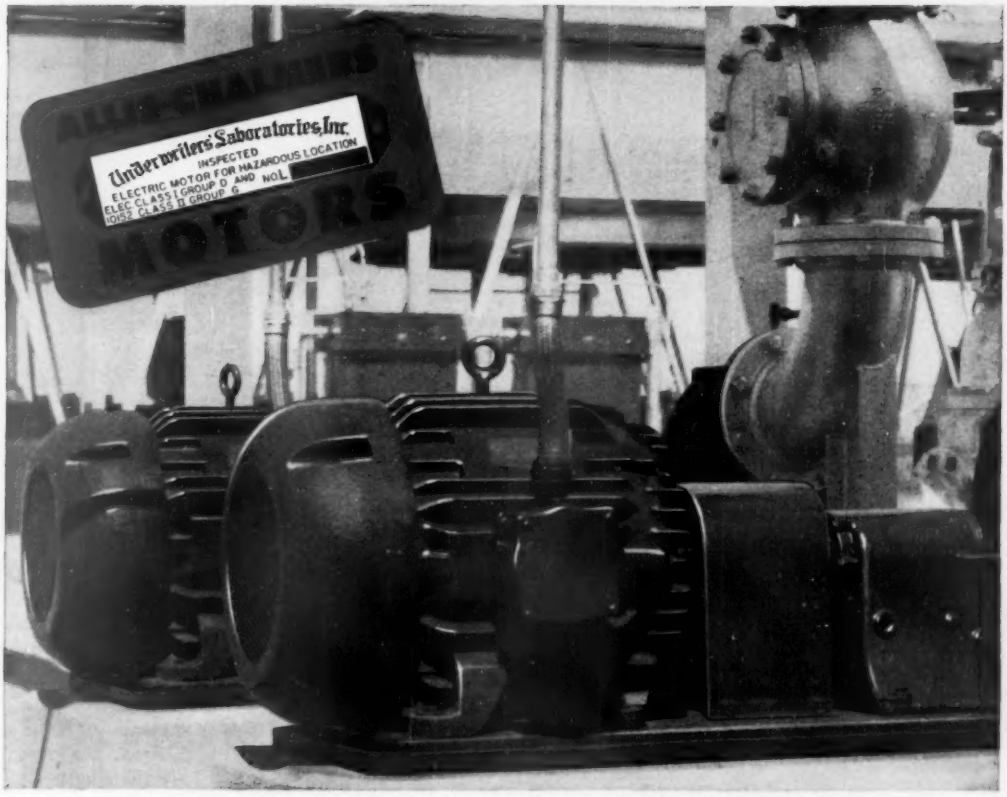
BLOCK
Brass, Forged Steel or Forged Stainless Steel



PRESSURE GAUGES AS SUPPLIED TO THE NEW ESSO REFINERY AT FAWLEY

PRESSURE GAUGES FOR ALL PURPOSES

WE ARE THE OLDEST PRESSURE GAUGE MAKERS IN THE WORLD



Get These 3 Low Maintenance Features

1 Wide Open Air Flow

No enclosed external air passages to clog. Easy to clean with cloth, brush, air hose or vacuum. Simply remove fan cover and whole radiating surface is exposed for inspection and cleaning.

2 Cast Iron Construction

Frame, conduit box and fan cover of cast iron resist corrosion. Fan is non-sparking, corrosion-resistant material. Well suited to outdoor operation.

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

3 Pre-lubricated Bearings

Ball bearings are double-shielded type, pre-lubricated at the factory. Periodic lubrication is not required under normal operating conditions, but provision is made for in-service lubrication if necessary.

GET COMPLETE INFORMATION on Allis-Chalmers motors for oil field and refinery service—complete with Allis-Chalmers coordinated control — from your nearby Allis-Chalmers Authorized Distributor or District Office, or write for Bulletins 51B7286 and 51B7149. Allis-Chalmers, Milwaukee 1, Wisconsin. A-3967

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Distributors, Certified Service Shops and Sales Offices throughout the country.

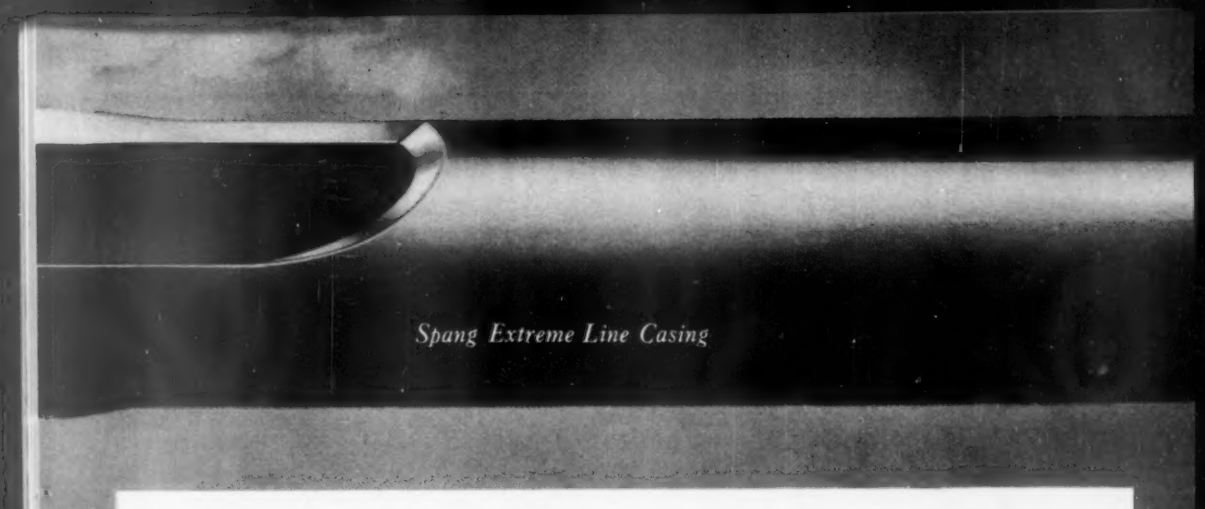
CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE V-belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral types from ⅜ in. to 72 in. discharge and up.

ALLIS-CHALMERS

Spang Tubular Products



Spang Extreme Line Casing

. . . by any standard of comparison they measure up to maximum service requirements

Throughout its many years of service to the petroleum industry the Spang-Chalfant Division of National Supply has been the source of the most complete range of oil country tubular products, and the most advanced in engineering, metallurgy and manufacturing.

The long list of tubular products bearing the Spang trademark is evidence of the research and continuous product development carried out at the Ambridge, Pennsylvania, laboratories, and throughout the world of oil with which National's field organization is in daily contact.

Thus the introduction of new Spang tubular products, such as Spangseal Tubing and Spangweld Drill Pipe, is further indication that National's equipment development program is keeping pace with the petroleum industry's demands.

By any standard of comparison your investment in drill pipe, casing, or tubing bearing the Spang Trademark is your assurance of adequate returns in serviceability, and trouble-free performance. The latest bulletin on Spang drill pipe and tool joints contains valuable information you'll want for your reference files—write Pittsburgh for your copy.

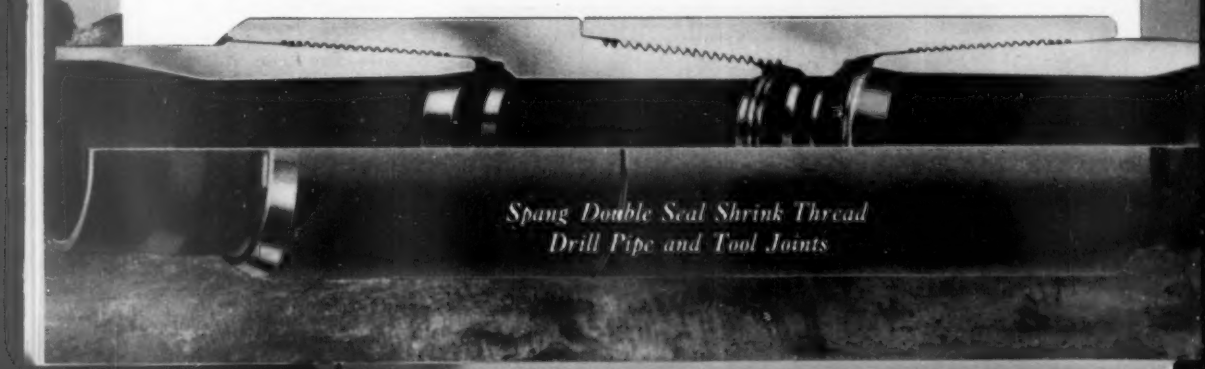
NATIONAL BLUE PRODUCTS

Spang-Chalfant Division

THE NATIONAL SUPPLY COMPANY

PITTSBURGH 30, PENNSYLVANIA

Division Tubular Offices: Denver, Colorado • Houston, Texas • Fort Worth, Texas • Los Angeles, California • Pittsburgh, Pennsylvania Tulsa, Oklahoma • Calgary, Alberta, Canada

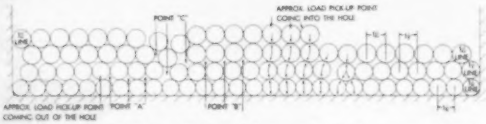


Spang Double Seal Shrink Thread Drill Pipe and Tool Joints

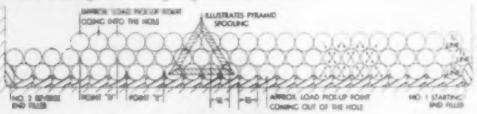
PAGES FROM THE LEBUS WIRE LINE SPOOLING HANDBOOK

PROGRESSIVE GROOVING

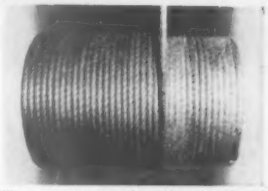
Eliminates WIRE LINE CUTTING IN!



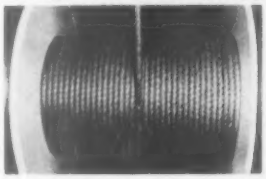
Above is an illustration of the plain drum spooling of a worn, tapered or stretched 1 1/8" wire line. Notice gaps, slipping over and cutting in at A, B, and C. Notice also amount of line needed for load pick-up when coming out and going back into hole.



Above is a LeBus grooved drum with the same worn, tapered or stretched 1 1/8" wire line. NO GAPS, NO SLIP-OVER, NO CUTTING IN. NOTICE that less line is required for load pick-up when coming out or going back into hole.



These two photos show the second and third layers of line being spooled on parallel side of LeBus Grooved Drum. They further illustrate Progressive Grooving attained with LeBus Grooving.



In the past, one of the greatest sources of trouble in wire line spooling has been the wire line CUTTING IN. This is due principally to the haphazard or uncertain line action of helical spooling. With helical spooling, it is difficult to prevent worn line from slipping over while lifting excessively heavy loads. Under the new LeBus System of Controlled Pyramid Spooling where 75% to 85% of the wire line forms grooves for the succeeding wraps (illustrated by diagrams above and photos to left), we accomplish what is called PROGRESSIVE GROOVING with 75% to 85% of each layer of wire line wraps. By this method, CUTTING IN can be eliminated, since each layer of wire line is held in grooves formed by the preceding layer of wraps.

Regardless of speed used in your hoisting operation, with Progressive Grooving, there is a minimum of possibility for line to crowd over, or slip over out of the line grooves and allow CUTTING IN on the first, second, third, fourth, fifth or any number of layers of wraps; that is, unless the operator becomes careless as to EXCESSIVE line wear, the traveling block, hook and elevator being TOO LIGHT, or the line being spooled too loosely on the drum. Mechanically, the maximum of true Progressive Grooving and Pyramid Spooling is obtained with the LeBus Grooving and Controlled Pyramid Spooling System.*

LEBUS INTERNATIONAL ENGINEERS LIMITED

Executive Offices: 305 Wichita Natl. Bank Bldg. WICHITA FALLS, TEXAS
SALES, SERVICE Control and Warehouse Stock LONGVIEW, TEXAS

WRITE FOR FREE COPY LEBUS WIRE LINE SPOOLING HANDBOOK

*Patented and Other Patents Pending

FORD'S *Heavy Duty* INDUSTRIAL ENGINES

meet America's most popular power needs!

FORD "134" 4-CYL., O.H.V.

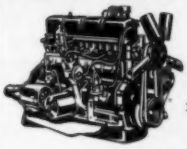
Ford's Overhead Valve Industrial Engines have been thoroughly tested and highly accepted for industrial applications in the field, and now a 4-cylinder power plant of the same type is being offered. This Ford "134" cu. inch engine incorporates notable advancements for still greater performance and operating economy. Bore: 3.4375 in. Stroke: 3.6 in. Rating (dyn.): 45 b.h.p. @ 2400 rpm.

Manufacturers of powered equipment throughout the U.S.A. are constantly in search of economical power to speed productive activities and increase profits.

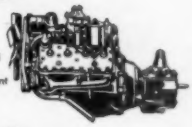
Because of its efficient mass production methods and nationwide service facilities, the Ford Motor Company is a popular source of economical, low-cost Industrial Power. *Here* on this page are the engines which Ford has designed and built to its famous Hi-Precision standards *especially* for the needs of Industry.

You'll find these Heavy Duty Engines at work today powering equipment in our vast oil fields, on our farms and in factories, around logging camps, sawmills, road building and huge construction projects.

If you're interested in any of the engine series shown, one of Ford's Staff of Sales Engineers will be glad to discuss your power problem and perhaps help you solve it advantageously.

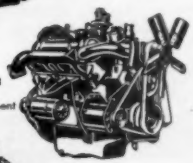


FORD "215" 6 cyl.
Industrial Engine
215 cu. in. displacement

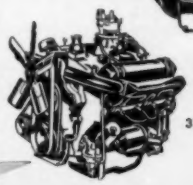


FORD "239" V-8
Industrial Engine
239 cu. in. displacement

FORD "254" 6 cyl.
Industrial Engine
254 cu. in. displacement

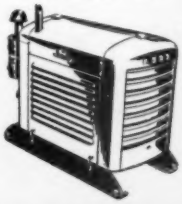


FORD "279" V-8
Industrial Engine
279 cu. in. displacement

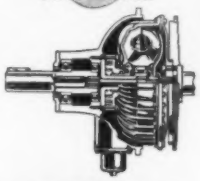


FORD "317" V-8
Industrial Engine
317 cu. in. displacement

TYPICAL FORD CLOSED TYPE POWER UNIT



FORD MULTA-TORQUE CONVERTER



Ford INDUSTRIAL ENGINES AND POWER UNITS

YOUR JOB IS WELL POWERED WHEN IT'S FORD POWERED

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FORD MOTOR COMPANY, 15050 Woodward Ave., Highland Park 3, Michigan

WE ARE INTERESTED IN INDUSTRIAL POWER FOR:

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(state your application)

Please send us latest literature on Ford Industrial Engines checked below:

☐ "134" 4-Cyl. ☐ "215" 6-Cyl. ☐ "239" V-8 ☐ "254" 6-Cyl.
☐ "279" V-8 ☐ "317" V-8 ☐ "MULTA-TORQUE" Converter

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ROCKWELL Type PLX
FOR PRODUCT PIPE LINES

ROTOCYCLE METERS

Measure Better— Profit More!

At the *business end* of any pipe line it will pay you *more* to measure with Rockwell Rotocycle meters. Consider these money saving, money earning facts. The exclusive Rotocycle design has a measuring chamber in which all parts freely revolve on anti-friction bearings. There is no metal-to-metal contact to cause wear. The motion is always in the direction of the fluid flow. It is identical to that of an electric motor.

This smooth, friction-free "Flo-ward" operation offers the least resistance to line flow. Thus with Rockwell Rotocycle meters you can save by using smaller propulsion units on your pumps and pay smaller bills for electric power.

There are now five sizes of these better meters available for either high or low pressure service. Temperature compensators, straight reading or printing registers are optional. Write for bulletins.

ROCKWELL MANUFACTURING COMPANY

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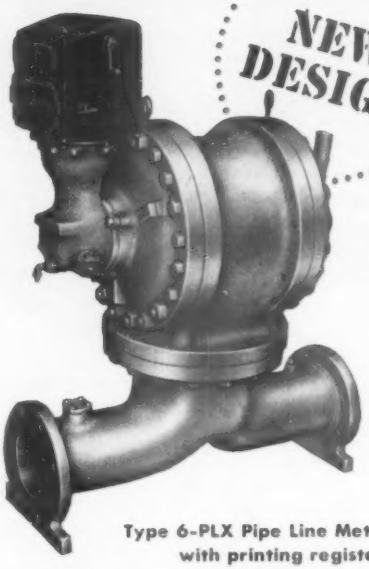
NEW DESIGN

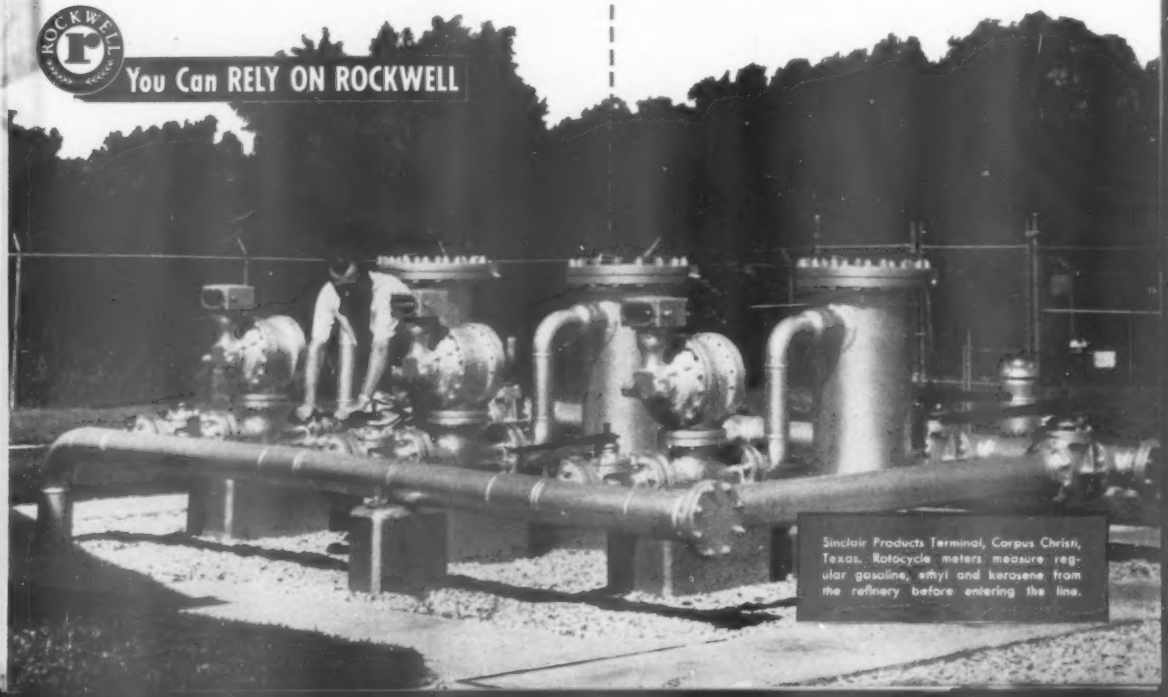


Type 6-PLX Pipe Line Meter with printing register.

Always the most positive of all rotary type meters, the Rotocycle meter design has been improved and refined to give even longer life, greater sustained accuracy. What's more, these improvements have been engineered so that the new rotor construction is interchangeable with the old—making conversion easy—in the field, if desired.

ROCKWELL

You Can RELY ON ROCKWELL



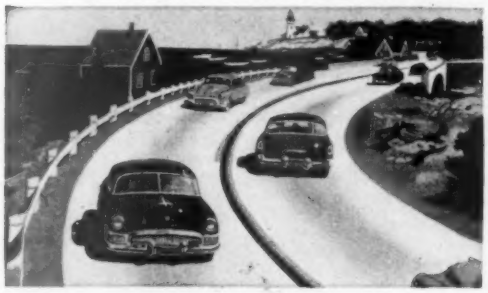
Sinclair Products Terminal, Corpus Christi, Texas. Rotocycle meters measure regular gasoline, ethyl and kerosene from the refinery before entering the line.

FOR 50 YEARS

The Greatest Name in Motor Oil!

Before 1903 motor oils used in cars had been developed for other purposes. Then came *Mobiloil*—first *successful* motor oil specifically developed for cars—and the auto industry was on its way!

It was at Kitty Hawk in 1903 that the Wright brothers made the first successful plane flight. On this occasion, and on other pioneering flights, they chose *Mobiloil* for top engine protection!



Today's car builders generally recommend a *heavy-duty* motor oil. New super-detergent *Mobiloil* more than meets this requirement – cuts engine wear, helps give longer engine life, better economy!

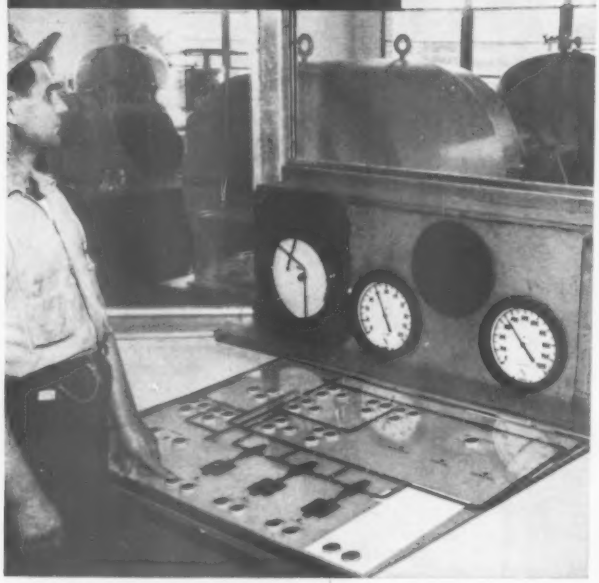
Today's sky-clippers set new safety records with oils made by the makers of Mobiloil!

1903 · 1953 50TH ANNIVERSARY

Why Sell Anything Less?

SOCONY-VACUUM OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO. GENERAL PETROLEUM CORP.

ENGINEERING REPORTS:



AUTOMATIC SEQUENCE CONTROL of pumping units at The Texas Pipe Line Company's Erath, La. station is provided from G-E control desk. Pressing a single push button automatically initiates entire starting or stopping cycle.

Engineered control system speeds station start-up

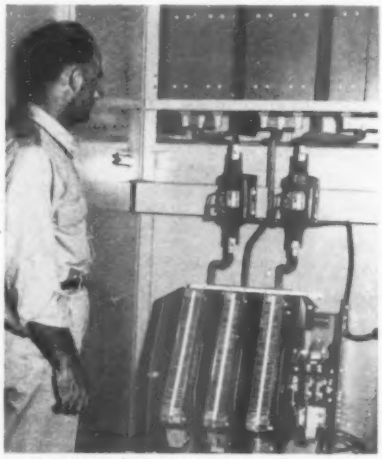
G-E equipment for automatic operation of pump motors installed fast at The Texas Pipe Line Company

Feature of two pumping stations recently put in operation by The Texas Pipe Line Company at Erath and Houma, La., is the automatic station-control system engineered by General Electric. Centralized in one operator's console are push buttons for automatic sequence control of each main pump motor and associated valves and blowers; simplified piping diagram; and a protective and alarm system. Complete wiring diagrams supplied by G.E. saved this company drafting time, cut installation cost, and helped speed the station's initial start-up.

Automatic station-control systems are only one of many ways in which G-E application engineers can help you cut pipeline pumping costs. For full information, contact your G-E Apparatus Sales representative or write for Bulletin GEA-5423 to General Electric Company, Section 661-40, Schenectady 5, N. Y.

FAST INSTALLATION of G-E control equipment at Erath station (above) was facilitated by complete wiring diagrams furnished by G-E engineers.

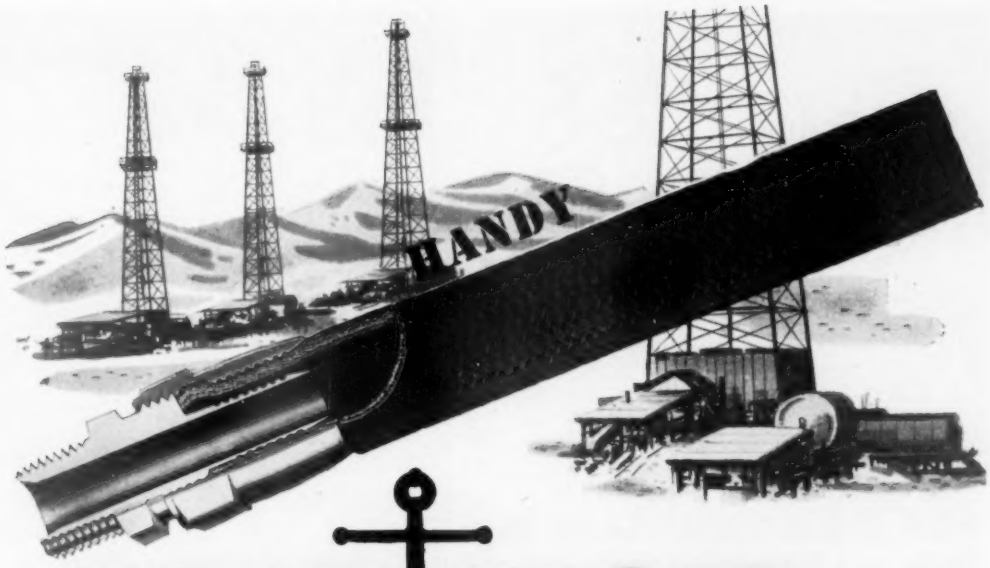
HIGH-VOLTAGE MOTOR CONTROL is provided by this G-E Limitamp assembly. Panel at right contains sequence-control and alarm-bell relays.



DEPENDABLE SWITCHING of high-voltage motor currents is provided by air-break contactors, shown under current-limiting fuses.

Engineered Electrical Systems for Oil Pipelines

GENERAL ELECTRIC



ANCHOR

REUSABLE COUPLING FOR TYPE QW HOSE

for original equipment and *fast field-repair*
— medium- and low-pressure service

Prevents leaks and blow-offs — exclusive patented grip gives extra safety, extra dependability, long life under severe service conditions.

Expensive downtime eliminated — repairs made immediately on the job without special tools.

Easy to assemble — vise, oilcan, and wrench are the only tools needed to assemble couplings and hose.

Reduces hose assembly inventory — carry one coil in hoze sizes you use, and cut to lengths you need when you need them.

Can be used over and over.

Ample flow capacity.

NEW!
REVOLUTIONARY
ANCHOR
SPLIT-FLANGE CLAMP
Positive leakproof connection without threaded joints. Bolt centers are located to distribute the forces evenly and prevent tilting of the clamp halves. Easy to assemble with small automotive-type wrench.

Find out how Anchor reusable couplings for type QW hose save time, trouble, money. Attach coupon to your letterhead and mail today.

D-15

Anchor Coupling Co. Inc.
Dept. OA-33 Libertyville, Illinois

I'd like to know more about
- ☐ Anchor Reusable Couplings for type QW hose
- ☐ New Anchor Split-flange clamp-type coupling

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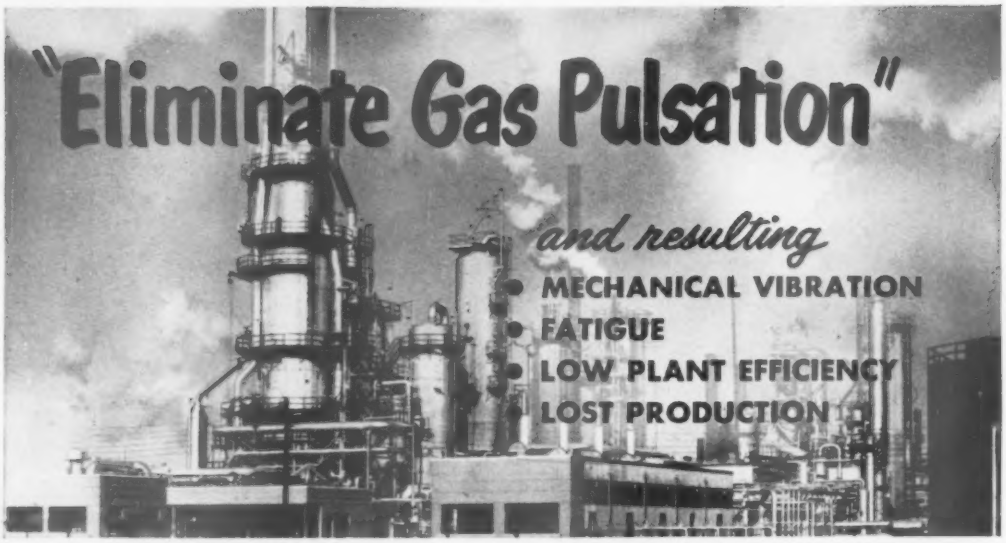
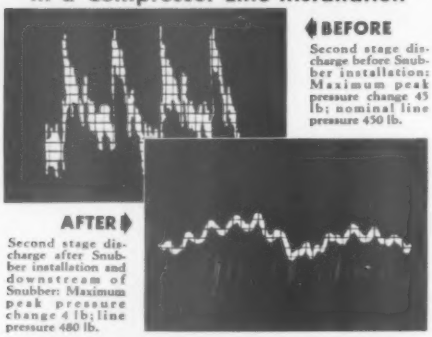


Solution to a typical Surge Problem in a Compressor Line Installation



BEFORE

Second stage discharge before Snubber installation: Maximum peak pressure change 45 lb; nominal line pressure 450 lb.

AFTER

Second stage discharge after Snubber installation and downstream of Snubber: Maximum peak pressure change 4 lb; line pressure 480 lb.

Send for your copy of a typical Burgess-Manning Pulsation Survey and Analysis Report

BURGESS-MANNING PULSATION SURVEY

Burgess-Manning pulsation surveys are conducted by trained and fully experienced engineers with electronic equipment including pressure pickup (transducer), amplifier, and oscilloscope. The pressure transducer is coupled as close to the gas stream as possible and faithfully reproduces in voltage the pressure changes in the pipe. This voltage is conducted to a three stage amplifier and then to the oscilloscope screen. Photographs are taken of the screen as a record of surge. Data is taken and recorded. Maximum peak pressure change is calculated. Report is prepared. Recommendations are made that best solve your problems.

CONSULT BURGESS-MANNING ENGINEERS

Gas pulsation in compressor piping systems often results in excessive vibration and material fatigue. This, in turn, necessitates constant maintenance in piping and equipment resulting in lower over-all plant efficiency.

Your compressor system pulsation problem can be solved by Burgess-Manning Company engineers. This division maintains a field service to make surveys and analyses of flow conditions in pressure piping. Trained engineers correlate this data for reference in making Burgess-Manning Gas and Air Line Snubber recommendations for new plants as well as for existing plants.

Write for your copy of a typical case history in which Burgess-Manning engineers solved a tough problem.

Typical application showing Burgess-Manning Gas and Air Line Snubbers installed on discharge side of multiple-stage gas compressors.

Burgess-Manning Gas & Air Line Snubber.

BURGESS-MANNING COMPANY

1203 Dragon Street
DALLAS, TEXAS

Chicago, Illinois — Libertyville, Illinois

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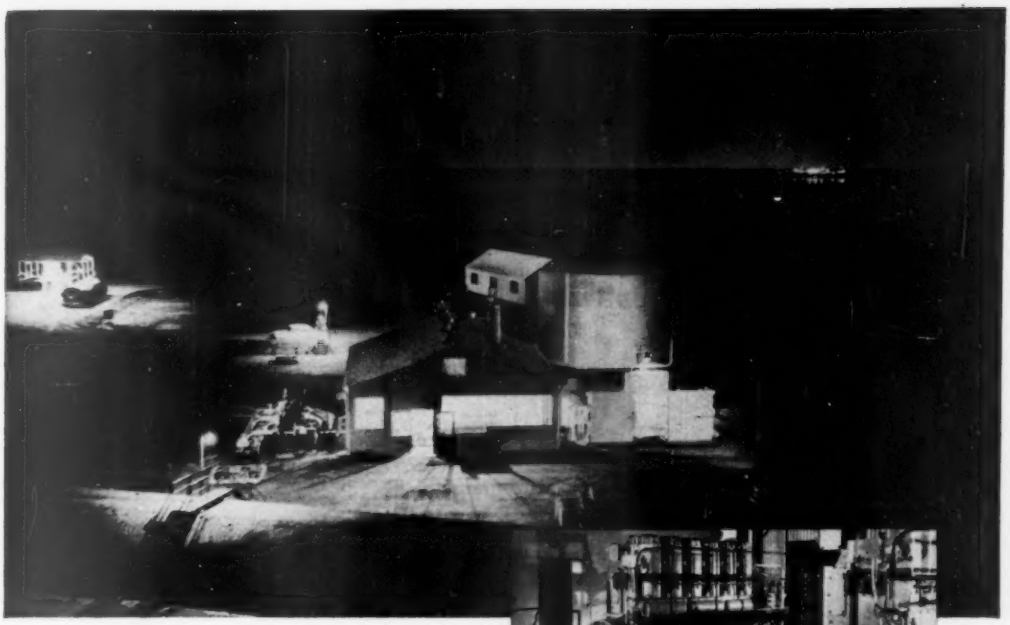
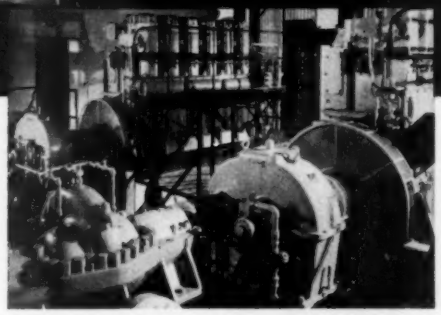


POWER—NIGHT OR DAY

ENTERPRISE Pipe Line Diesels cut tanker loading time and costs at Union Oil Ventura Pumping Station

Pumping crude from tanks to tankers calls for power that's ready when you need it—*night or day*. The intermittent use of power required for this fast moving operation demands *sure starting* and *continuous pumping* on *short notice*. The ability of these diesels to handle a fluctuating load increases pump efficiency and capacity. At Ventura, as with other similar ENTERPRISE installations, this means *more oil pumped faster* and shorter turn-around-time for the tankers. These important operating characteristics are not found in other pumping methods.



Two Enterprise DSG-6 Diesels, rated 465 HP at 450 RPM, furnish all the power for pumping an average 12,000 bbls. of crude per hour shore-to-ship, through 4,280 ft. of 20" cement coated line.

ECONOMY PLUS EFFICIENCY WITH ENTERPRISE DIESELS

- **Fuel flexibility**—Engines operate efficiently on standard diesel fuel, heavy fuel or dual-fuel.
- **Handle fluctuating loads** through a wide engine speed range for top pump efficiency regardless of viscosity changes.
- **Minimum plant investment**—more power in less floor space with compact ENTERPRISE power.
- **Low personnel requirements** for supervision, operation and maintenance.
- **Fully automatic operation**—wherever required or desired.
- **Remote location**—there are no power interruptions with ENTERPRISE Diesels.
- **Service and parts** are available within hours to the most remote locations.

Write for full details on the complete line of ENTERPRISE 4-cycle Diesel and Dual-Fuel engines, 68 to 2056 HP, turbocharged or normally aspirated.

Enterprise DEPENDABLE Diesels

ENTERPRISE ENGINE & MACHINERY CO.

A Subsidiary of General Metals Corporation

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Boston • Chicago • Ft. Worth • Kansas City • Los Angeles • New Orleans
New York • San Diego • Seattle • St. Louis • Washington, D. C.

WHY YOU'LL LIKE J&L PRODUCTION SERVICE

Where wells are on the pump, experience in the J&L supply store works for customers like compound interest.

Knowledge piles up about little things that make the difference between a dependable, profitable producer and a chronic nuisance.

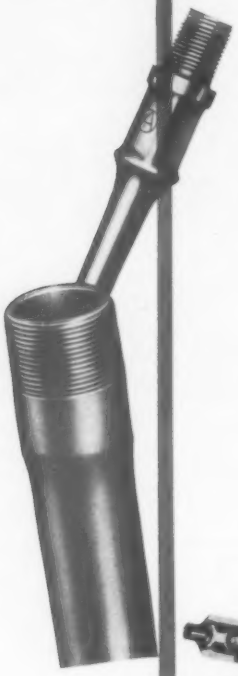
J&L service to producers is not only informed, but adaptable:

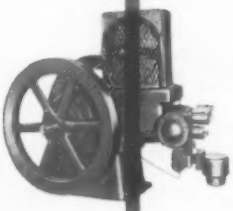
AXELSON makes a bottom hole pump to cope with every known well condition.

CABOT pumping units have beam ratings from 2,000 to 30,000 pounds; reducers from 7,900 to 320,000 inch-pounds; more than 35 different assemblies.

Of course J&L tubing, AXELSON rods, FAIRBANKS-MORSE "ZC" engines, and CENTURY motors are as standard as handles in hammers and locks on doors.

Production equipment at your J&L supply store is sold with a proper sense of responsibility to the buyer and the industry.





JONES & LAUGHLIN STEEL CORPORATION
SUPPLY DIVISION

J&L STEEL

***General Offices:* TULSA, OKLAHOMA**

88 STORES • 19 OFFICES • 9 RESIDENT SALESMEN

EXPORT: 405 Lexington Ave., New York, N. Y., U. S. A.

Arquad® solves costly water flood problems

Armour chemical reduces corrosion rate up to 99% and controls bacteria and algae growth

Many water flood systems, pipe lines and brine disposal operations are plagued by corrosion, bacteria and algae growth. Frequent and costly shut-downs are the result. A new Armour chemical—Arquad S-2C—ends these problems economically and effectively. A combination of quaternary ammonium compounds, Arquad S-2C is a potent germicide which plates out as a protective barrier on metal surfaces in contact with corrosive fluids. As a result three major problems—control of algae growth, control of bacteria and control of corrosion—are eliminated by one Armour chemical. Cost of combating these problems with Arquad S-2C is about one-half the average of similar treatments using competitive inhibitors and bactericides.

Control of Corrosion, Bacteria-Algae Growth

In a recent California water flood, laboratory and field tests reported an appreciable corrosion rate, presence of black waters and visible slime build-up in the systems. After the introduction of Arquad S-2C at a rate of 6-10 ppm, the waters cleared, algae was completely destroyed and corrosion reduced to practically nothing.

Results from another flood operation in Eastern Oklahoma show the use of Arquad S-2C reduced the rate of corrosion 99.5% and completely cleared the turbid, red waters which resulted from bacterial-algae contamination.

Corrosion Inhibition and Acid Waters

In secondary recovery water floods, acid waters are often preferred to improve injection rates and open the formation through dissolution of corrosion products. The severe corrosive effect of acid waters on metal equipment can be controlled by Arquad S-2C to make this technique more efficient and reduce down-time.

Technical Bulletin E-6 covers this problem of control

of corrosion and bacteria-algae growth in water-flooding operations. Samples of Arquad S-2C and this booklet—free, of course—will show you how profitable and economical corrosion and bacteria control can be. Send the coupon today for both the booklet and a sample for either laboratory or field testing. Prices will be quoted on request.

"Arquad" is a registered trade name of Armour and Company

ARMOUR CHEMICAL DIVISION

Mail This Coupon Today!

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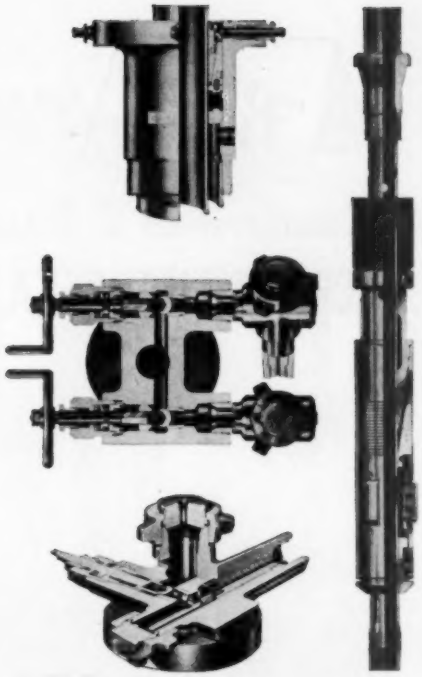
© ARMOUR AND COMPANY

What one company do you think has done the most in the past five years to improve production equipment performance?



O-C-T "C-19" Casing Head . . . the first casing head designed specifically to eliminate open hole hazards in deep, high pressure wells ● O-C-T "JE" Flow Control . . . effects cost and weight savings up to 90%. ● O-C-T "JE" Dual Flow Control . . . replaces thirteen different fittings and saves as much as $700 ● O-C-T Packers . . . designed to eliminate the four major causes of packer failures.

Here's what O·C·T has done!

During the twenty-five years that Oil Center Tool Company has served the oil industry, O-C-T products have been designed with specific industry needs in mind . . . manufactured with performance in mind . . . sold with service in mind.

But never before in our history have we introduced as many truly outstanding products . . . products that have received immediate industry-wide acceptance . . . as we have during the past five years.

Each one of these new O-C-T products was designed to improve production equipment performance and safety . . . and industry acceptance has proved the need.

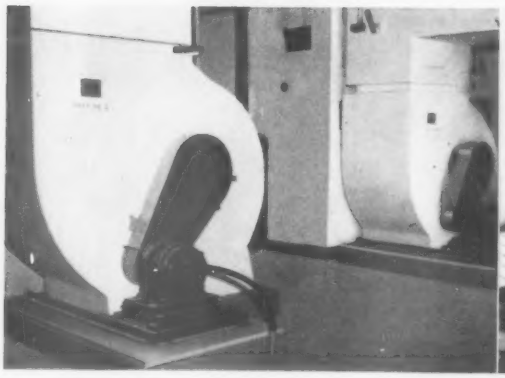
But rather than rest on these laurels, O-C-T has instituted an even greater development program to bring about other improvements in the future to meet future needs of the industry.

OIL CENTER TOOL COMPANY HOUSTON

O-C-T Products are available through more than 700 supply stores.

"Buffalo" *Tips on Getting the Best Service from your* **Fans**

Considerations in Choosing CENTRIFUGAL FANS



1. CAPACITY RANGE FOR THE LARGEST VENTILATION, EXHAUST AND AIR CONDITIONING JOBS
2. HIGH EFFICIENCY EVEN WHEN NEAR ELBOWS IN DUCT
3. QUIET, MEDIUM SPEED, MODERATE VELOCITY FANS — AVAILABLE FOR HIGH PRESSURE SYSTEMS

The large "Buffalo" Limit-Load Fans, above, on air conditioning supply service, are typical of the installations where these all-around fans are used. Available for pressures up to 15" s.p., they are giving highly satisfactory service in the new high-pressure, small duct systems. Also, "Buffalo" Limit-Load Fans have the advantage of a non-overloading characteristic—they cannot be overloaded. For complete information to help your choice of fan, write for our latest Engineering Bulletin.

Considerations in Choosing AXIAL FLOW FANS

1. SPACE SAVINGS — LITTLE LARGER THAN DUCT
2. LIGHT WEIGHT — SIMPLE, INEXPENSIVE INSTALLATION
3. HIGHEST EFFICIENCY IN STRAIGHT LINE DELIVERY
4. FOR ALL LIGHT DUTY AIR MOVING JOBS

Note how the "Buffalo" Vaneaxial Fans in the photo above fit into roof exhausts like a section of pipe. In any low-pressure duct-mounted application where the fan is *not* near an elbow, these fans give you high efficiency. For further information in choosing between centrifugal and axial flow fans, write for BULLETIN 3533-C, which contains a comparison performance chart, as well as complete data on "Buffalo" non-overloading Axial Flow Fans.

"Buffalo" FIRST FOR FANS

BUFFALO FORGE COMPANY

525 BROADWAY BUFFALO, NEW YORK

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

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VENTILATING | PRESSURE BLOWING | AIR CLEANING | COOLING | AIR TEMPERING | HEATING | INDUCED DRAFT | FORCED DRAFT | EXHAUSTING

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OPEN HOLE TESTING

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HYDRAULIC JARS

● Continuous research and development in the fine art of well testing for more than 20 years assures operators the world over of the unfailing results they have come to expect from Johnston.

Wherever wells are drilling you'll find a Johnston Representative ready to serve you.

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SERVICE BRANCHES IN ALL ACTIVE AREAS

There's a Johnston Service Representative Near You

FORMATION AND CASING TESTING — JOHNSTON

4 powerful reasons why 1953 CHEVROLET Advance-Design Trucks give you more of what you want

MORE POWER—GREATER ECONOMY! Expect a wonderful advance in power, performance and economy in Chevrolet heavy-duty trucks! The great 1953 Loadmaster engine—standard on 5000, 6000 Series, heavy-duty and forward control models, optional on 4000 Series heavy-duty trucks—has a new high compression ratio of 7.1 to 1, develops even more horsepower than before. And the Thriftmaster engine in light- and medium-duty models brings you traditional Chevrolet economy.

TRUCKS ENGINEERED FOR YOUR PAYLOADS! Chevrolet trucks are designed for the job they will do—engineered from tires to axle, springs, clutch and power plant to do that job with the greatest efficiency and lowest cost. You don't waste money on too heavy a truck or too light a truck. You buy the *right* truck for *your* job!

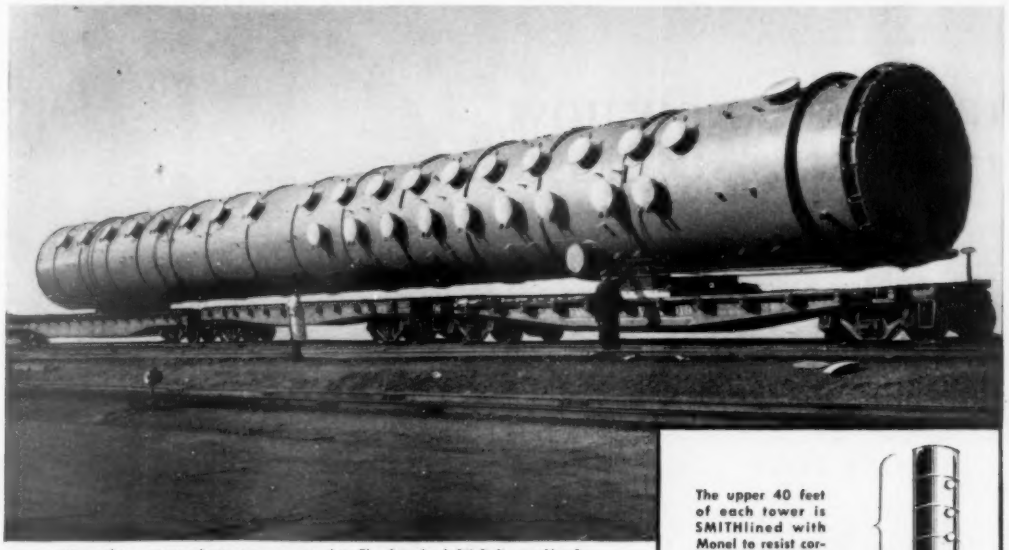
MORE STAMINA! More strength where strength counts most! In 1953, all Chevrolet trucks have stronger, brawnier, more rigid frames. They have heavier, sturdier construction that means a longer, lower-cost life for your truck. And they have new larger, safer, longer lasting brakes on many models, too!

GREAT TRUCK FEATURES! In addition to the many *NEW* things you'll find in these 1953 Chevrolet trucks, you'll also find many great features yet unmatched by other makes of trucks. Features such as Flexi-Mounted Cabs, Unit-Designed Bodies, Ball-Gear Steering and many others help make Chevrolet Advance-Design trucks your greatest buy. Chevrolet Division of General Motors, Detroit 2, Michigan.

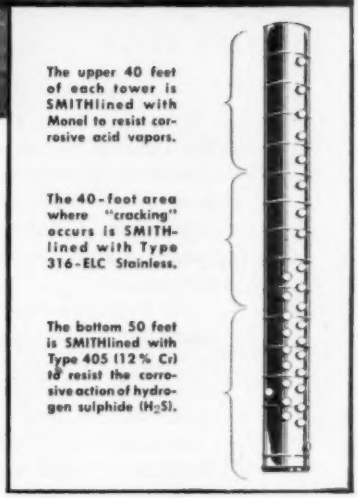
CHEVROLET ADVANCE-DESIGN TRUCK FEATURES

TWO GREAT VALVE-IN-HEAD ENGINES—the Loadmaster or the Thriftmaster—to give you greater power per gallon, lower cost per load. **POWER-JET CARBURETOR**—for smooth, quick acceleration response. **DIAPHRAGM SPRING CLUTCH**—for easy-action engagement. **SYNCHRO-MESH TRANSMISSION**—for fast, smooth shifting. **HYPOID REAR AXLE**—for dependability and long life. **TORQUE-ACTION BRAKES**—on light-duty and medium-duty models and on front of heavy-duty models. **TWIN-ACTION REAR BRAKES**—on heavy-duty models. **DUAL-SHOE PARKING BRAKE**—for greater holding ability on heavy-duty models. **CAB SEAT**—with double deck springs for complete riding comfort. **VENTI-PANES**—for improved cab ventilation. **WIDE-BASE WHEELS**—for increased tire mileage. **BALL-GEAR STEERING**—for easier handling. **UNIT-DESIGNED BODIES**—for greater load protection. **ADVANCE-DESIGN STYLING**—for increased comfort and modern appearance.

CHEVROLET
first in demand
in value
in sales



First of two atmospheric towers erected in The Standard Oil Refinery, No. 1, Cleveland, Ohio, each 130 feet high, 13 feet O.D. including nozzles and manways, and weighing 200,000 pounds.


The upper 40 feet of each tower is SMITHlined with Monel to resist corrosive acid vapors.
The 40-foot area where "cracking" occurs is SMITHlined with Type 316-ELC Stainless.
The bottom 50 feet is SMITHlined with Type 405 (12% Cr) to resist the corrosive action of hydrogen sulphide (H_2S).

THREE-STAGE atmospheric tower FOR SOHIO

A. O. Smith Process of "Smithlining" Permits Three Selective Linings in Single Refinery Tower

The economical solution of varying corrosion conditions in a single vessel is exemplified in the construction of two unusual atmospheric towers for The Standard Oil Refinery No. 1, Cleveland, Ohio.

Three types of lining, each specific for the corrosion condition in each of the three stages in the tower, were selected and bonded to the carbon steel structure by the A. O. Smith process of Smithlining.

Smithlining is the closely controlled resistance welding process of inseparably bonding alloy sheets to carbon steel vessel walls. Most alloys can be applied by this process. All liner materials can be rigidly inspected as to gauge requirements, surface finish, chemical analysis, mechanical properties and corrosion requirements prior to attachment.

The two towers were ordered and erected by Arthur G. McKee & Company of Cleveland, Ohio.

For assurance of superiority in vessel design and construction and for aid in solving vessel application problems, call on A. O. Smith, where the industry's leading laboratory, design and engineering groups are at your service.

Contact the nearest office, listed below, or write to A. O. Smith Corporation, Vessel and Heat Exchanger Division, Dept. OG-353, Milwaukee 1, Wisconsin.

INDUSTRY COMES TO A. O. SMITH
WITH HEAT EXCHANGER PROBLEMS

Research and Engineering Building

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VESSELS • HEAT EXCHANGERS

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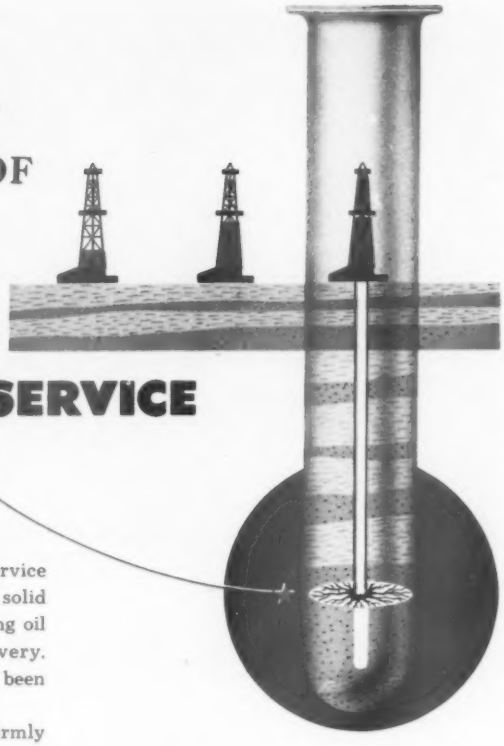
GREATER KNOW-HOW INCREASES SUCCESS OF

HALLIBURTON'S HYDRAFRAC SERVICE



The vigorous growth of Hydrafrac Service operations throughout the industry is solid proof of its continuing success in boosting oil output and increasing ultimate recovery. Results, in widely varied instances, have been spectacular.

But Hydrafrac treatments, though firmly established as potent producing aids, may not be applicable in each instance. Success of the operation may depend to a large extent on correct evaluation of all available well data.

Accurate interpretation of this data makes Halliburton trained specialists a major factor in the growing success of this service. Their skill in analyzing data on permeability, reservoir energy, production and work-over histories, physical formation characteristics, and condition of well equipment oftentimes determines if Hydrafrac Service can boost well output.

This considered judgment, backed by Halliburton experience, has paid off for many operators. One survey reveals that 60% of the first Hydrafrac-treated wells responded with a two-year sustained production boost of 200%. And another survey covering more than 9,000 Hydrafrac-treated wells showed that 75% responded with an additional oil recovery that averaged 175%!

The skill of Halliburton specialists in evaluating well data is available without obligation. It could be mighty important for you to investigate Hydrafrac Service on your next well completion – or in reviving a worn out producer.

Your nearby Halliburton representative will gladly give you the facts on this service. Or contact Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

HALLIBURTON

YEARS AHEAD IN PRODUCTION IMPROVEMENT TECHNIQUES

PERFECT HEADWORK...

Tough, Precision-Shaped Heads of SHEFFIELD Bolts Defy Wrench Slippage

SHEFFIELD

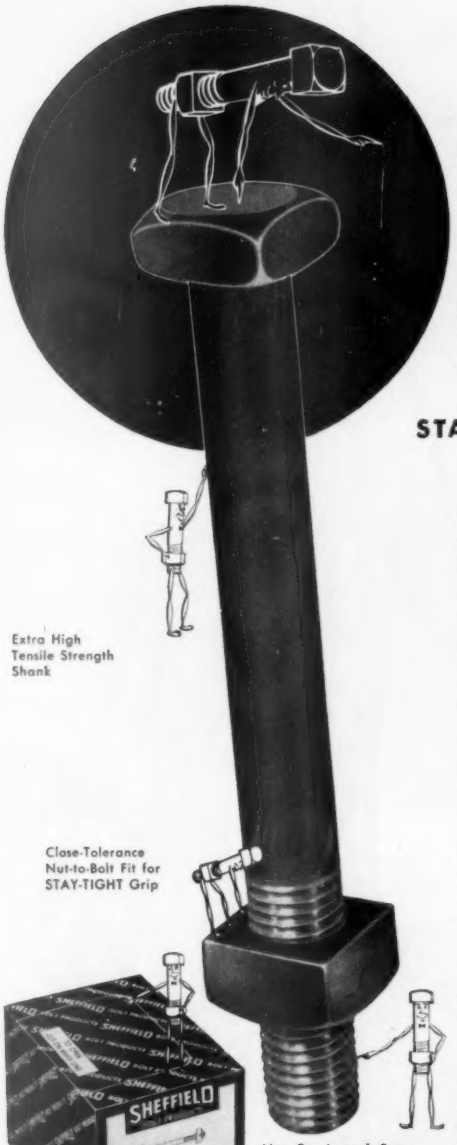
STATISTICALLY-CONTROLLED QUALITY WORKS Better... SELLS Better!

LABORATORY and technological control of steel making, added to long experience in bolt making are the important factors in earning and holding the confidence of those who have sold and used Sheffield Bolt and Nut Products since 1888.

RIGID INSPECTIONS are made at every step of manufacture, and the results analyzed by statistical quality control methods similar to those developed in aircraft production.

HIGH LEVEL QUALITY is thus assured—the kind of uniform quality that does a better job and causes so many customers to prefer Sheffield.

IT'S EASIER THAN EVER to handle and sell these better Sheffield Bolt and Nut Products—thanks to the new, streamlined package with hinged lid that lifts up for display and easy access.



New Eye-Appeal, Suggestion-Selling, and Easy Order Filling with this SHEFFIELD HINGED-COVER CARTON

SHEFFIELD
Quality Starts with SHEFFIELD Special Analysis Steel...

SHEFFIELD STEEL CORPORATION
HOUSTON KANSAS CITY TULSA
SUBSIDIARY OF ARMCO STEEL CORPORATION

easier to coil, easier to handle

Trioflex Rotary Hose

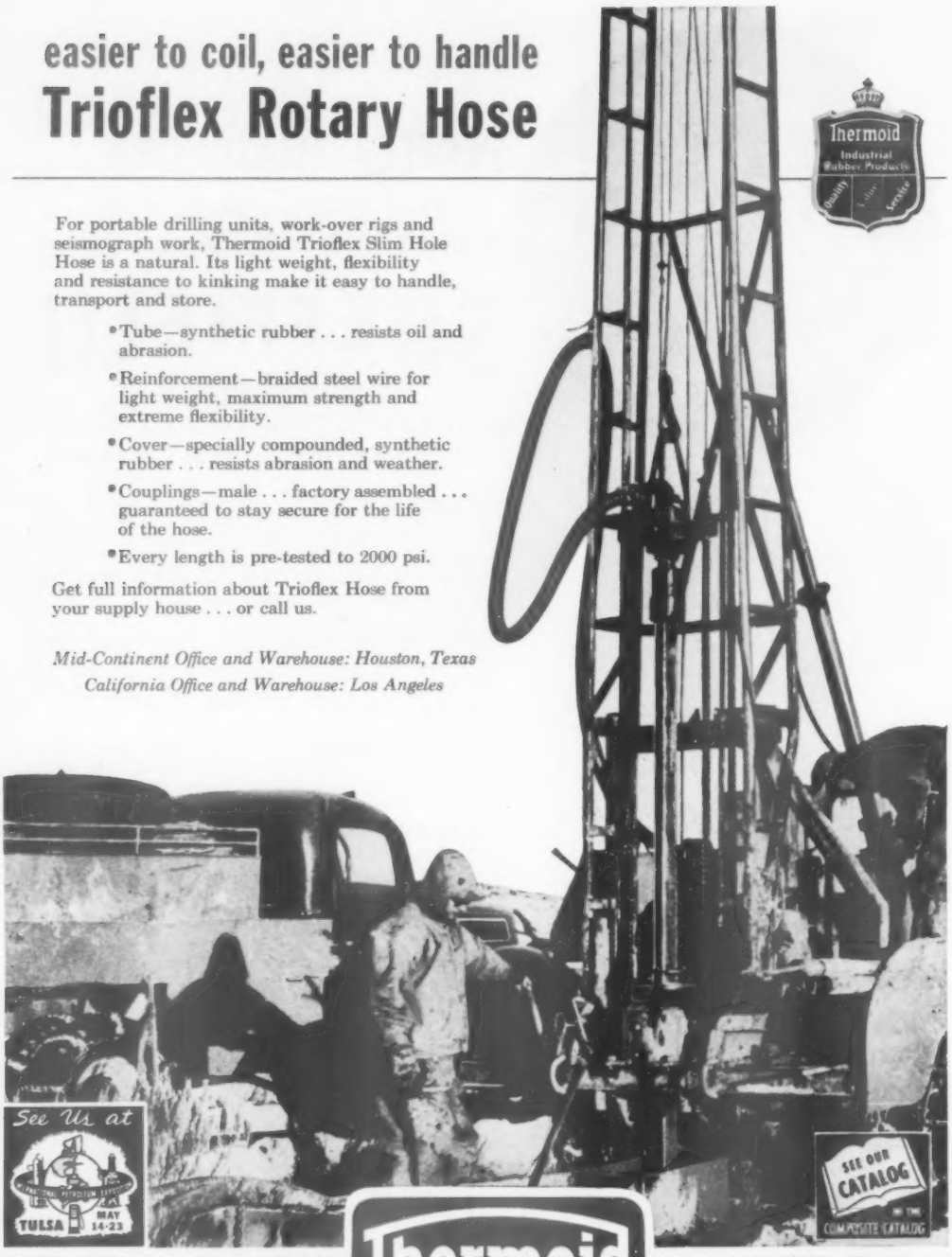
Thermoid Industrial Rubber Products — Quality · Service

For portable drilling units, work-over rigs and seismograph work, Thermoid Trioflex Slim Hole Hose is a natural. Its light weight, flexibility and resistance to kinking make it easy to handle, transport and store.

- Tube—synthetic rubber . . . resists oil and abrasion.
- Reinforcement—braided steel wire for light weight, maximum strength and extreme flexibility.
- Cover—specially compounded, synthetic rubber . . . resists abrasion and weather.
- Couplings—male . . . factory assembled . . . guaranteed to stay secure for the life of the hose.
- Every length is pre-tested to 2000 psi.

Get full information about Trioflex Hose from your supply house . . . or call us.

Mid-Continent Office and Warehouse: Houston, Texas
California Office and Warehouse: Los Angeles



Thermoid

Powerflex Rotary Hose • Trioflex Slim-Hole Rotary Hose • Mud-Flo Slush Pump Hose • Flexible Discharge Units • F.H.P. and Multiple V-Belts • Oil Country Flat Belting

Wire Line Turn Backs • No-Wip Line Savers • Stuffing Box Rings • All Types of Hose • Molded Specialties • Brake Blocks

Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah

in WIRE ROPE, too, survival calls for the RIGHT KIND of muscle

Powerful, constrictive muscles give the python the crushing strength that enables him to exist under the grim rules of jungle law—where only the fittest survive.

Same way with wire rope. Here again, ability to last under adverse conditions demands the right kind of muscle. Bending Fatigue . . . Shock Stress . . . Abrasion . . . Load Strain—each demands wire rope that best combines the required resistance factors to overcome the destructive forces encountered in different types of service.

Complete quality control from ore to finished rope; long experience and specialized know-how — these are your assurance that in Wickwire Rope you always get the right construction . . . the right grade of steel and size of wire for long-lasting reliable service on your particular job.

See your Wickwire Rope distributor or contact our nearest sales office.

THE COLORADO FUEL AND IRON CORPORATION—Abilene (Tex.) • Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
THE CALIFORNIA WIRE CLOTH CORPORATION—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New York • Philadelphia

WICKWIRE ROPE
A CF&I PRODUCT

A YELLOW TRIANGLE ON THE REEL IDENTIFIES WICKWIRE ROPE

WICKWIRE ROPE
CF&I
PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

9584

HYDRATROL LATHES

LARGE HOLLOW SPINDLE TYPE

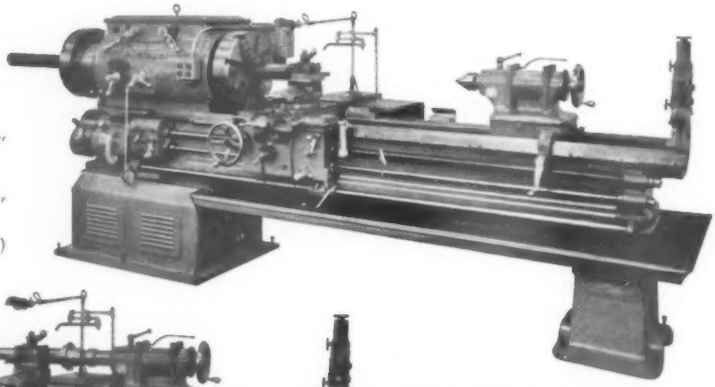
Check These 3 Points of... versatility

1. Machine long work chucked through spindle.
2. Machine work between centers.
3. Also built with beds and carriages on each end of headstock for machining both ends of a shaft at one time.

Both Illustrations Show the 18" Hollow Spindle 7⅛" Hole

SIZES 18" TO 36"

Small — 18" & 20" up to 7⅛" Hole
Medium — 25" up to 12" Hole
Large — 32" & 36" up to 16⅛" Hole
(Standard Type Lathes 16"-36")



For Faster Production, Better Work, Lower Costs!

IMPORTANT FEATURES

Timken Bearing Spindles.

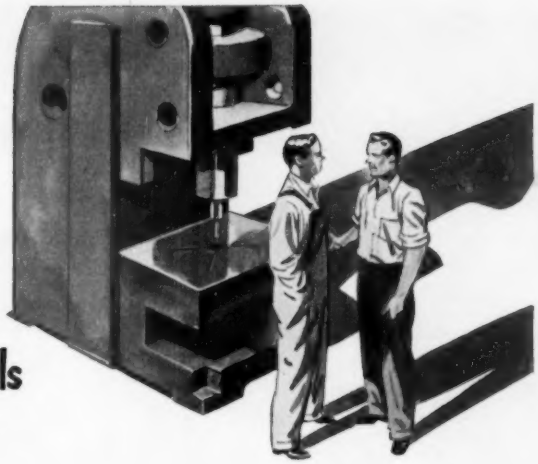
Hydraulic clutches for forward and reverse, controlled from apron or headstock.

Hydraulic brake for close position control.

Hydraulic clutches self-compensating. No adjustment and full power capacity at all times.

LEHMANN MACHINE COMPANY

CHOUTEAU AT GRAND • SAINT LOUIS 3, MISSOURI



a few words about alloy steels

or... how your alternate steel problems can profit from a Republic Suggestion

Stumped by government restrictions on the alloy steel grades you've been using for years? Faced with the problem of working out machining and heat-treating procedures on alternate alloys... carbon or stainless steel?

Call in the Republic 3-Dimension Metallurgical Service. A Republic Field Metallurgist, backed up by the Republic Mill and Laboratory Metallurgists, will work with your metallurgist to make the switch to alternate alloys easier.

You will be working with the leading producer of alloy steels. We'll gladly use our experience to help you get all the benefits from the alloys now available.

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

LAB FIELD MILL
3-DIMENSION
Metallurgical Service

Republic ALLOY STEELS

REPUBLIC STEEL

Other Republic Products include Carbon and Stainless Steels—Sheets, Strip, Plates, Pipe, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

Joints Tight... Threaded Right with TOLEDO

Toledo SIMPACT—self-contained, adjustable threader, 1" to 2" pipe.

TOOLS DESIGNED TO SPEED PRODUCTION ...CUT COSTS!

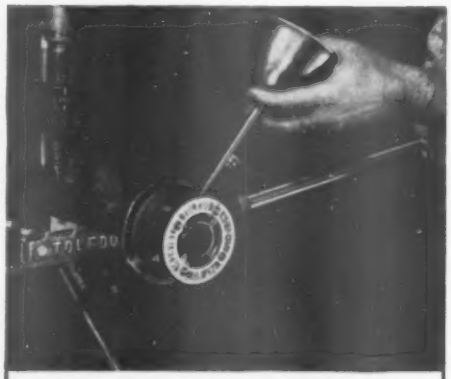
Any way you look at it—you'll do better with TOLEDO Pipe Tools and Power Pipe Machines on the job!

Better workmanship...good mechanics for fifty years have found they can always depend on TOLEDO to produce clean-cut threads for tight, leak-proof joints.

Faster production . . . whether it's hand tools or power pipe machines, Toledo gives you top-speed threading, cutting and reaming . . . ease of operation . . . accurate, efficient performance.

Lower costs . . . it all adds up to *big savings for you* in job-time and labor with Toledo dependability! Write for catalog on complete line. The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office: 165 Broadway, Room 1310.

Toledo No. 999 2" pipe machine, wheel or knife cut-off.



Toledo Small Ratchet Threaders made in three models, ⅛" to 2" pipe.

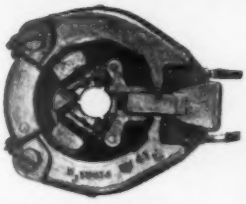
RELY ON THE LEADER

TOLEDO

PIPE TOOLS . . . POWER PIPE MACHINES . . . POWER DRIVES

BJ MEDIUM WEIGHT POWER TUBING SPIDER

...puts power to work for you!



from the top...

from the side...

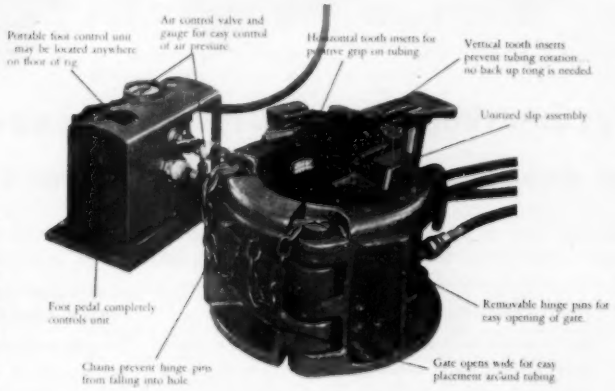
Check the BJ Power Tubing Spider *from every angle*. You'll see the new vertical-tooth inserts which eliminate the need for back up tongs. Check the sturdy hinge pins with safety chains, and the wide angle gate which allows easy placement of the spider around the tubing. Watch the fast operation of the slips and the sure grip of the extra-long replaceable tooth inserts. Slips mechanically lock in up position while running the stand. There's no crimping or bottlenecking of tubing. From every angle you'll discover that for your rig you can't buy a better tubing spider than a BJ Power Tubing Spider.

BJ's new outstanding Power Tubing Spider is designed to give you faster, safer and more efficient operations on tubing jobs... *to put more power to work on your rig!*

BJ POWER TUBING SPIDER IS FASTER...the entire operation of the spider is power controlled. A touch of the foot pedal and the slips are instantly *pressure* set or *pressure* raised.

BJ POWER TUBING SPIDER IS SAFER...dangerous hand setting of slips is eliminated. The foot control unit may be placed in any safe, convenient location on the floor of the rig...out of the way...ready for instant action...safe! Slips are set automatically if bumped by elevator...and cannot jump out or fall in the hole.

BJ POWER TUBING SPIDER IS MORE EFFICIENT...crews work better when they know they are working with a safe power tool. Increased safety and faster trips mean increased efficiency for your entire operation.


Portable foot control unit may be located anywhere on floor of rig
Air control valve and gauge for easy control of air pressure
Horizontal tooth inserts for positive grip on tubing
Vertical tooth inserts prevent tubing rotation... no back up tong is needed
Unitized slip assembly
Foot pedal completely controls unit
Removable hinge pins for easy opening of gate
Chains prevent hinge pins from falling into hole
Gate opens wide for easy placement around tubing

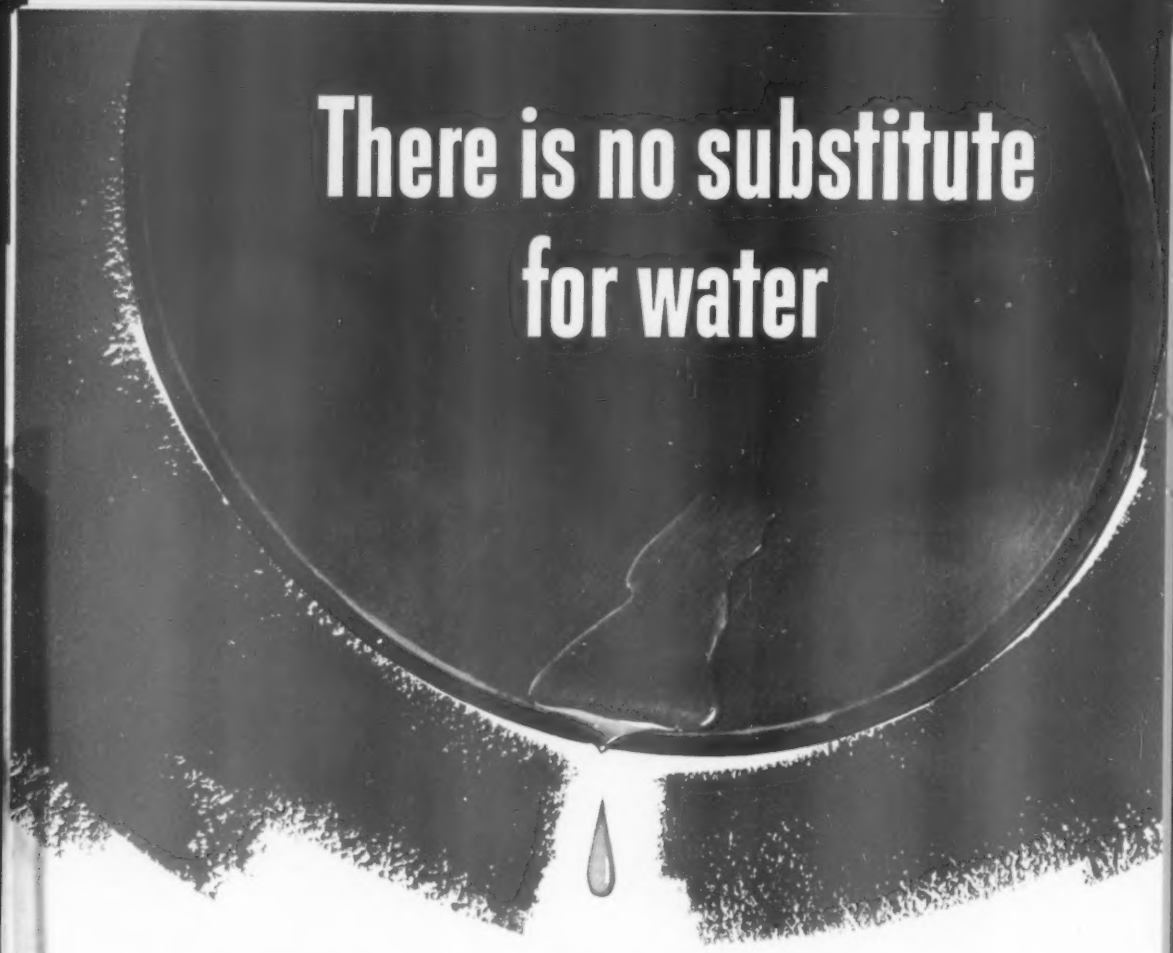
...from every angle—you can't buy better than BJ!

See your local BJ Oil Tool Representative today

BJ MEANS ENGINEERED OIL TOOLS

Byron Jackson Co.

OIL FIELD & INDUSTRIAL SPECIALTIES



. . . and there is no substitute for experienced engineering in developing a dependable water system

Nothing has ever taken the place of water among the basic needs of man. And nothing will ever take the place of safe, sure, *experienced* engineering in developing a dependable water supply.

Layne's reputation as the world's most experienced developer of well water systems was earned by engineering skill every step of the way—from on-the-spot geological surveys to the precision designing of each pump for its particular job. For the best in well water systems, there is no substitute for Layne engineering.

Let Layne engineers help you PLAN AHEAD on your water needs

Layne welcomes the opportunity to share in long-range planning for water-system needs. Contact your nearest Layne Associate Company or write Layne & Bowler, Inc., General Offices, Memphis 8, Tenn.

Layne

WATER WELLS

VERTICAL TURBINE PUMPS

Layne Associate Companies Throughout the World

They Say—

Change in the Interior

"After years of Truman cabinet members' huffing and puffing for the federal tidelands grab, it seems almost like a dream to hear the present successor to Secretaries of the Interior Ickes, Krug and Chapman outspokenly advocating state ownership of the offshore lands out to their historic boundaries.

"Secretary Douglas McKay even approves Texas' special claim to the submerged oil reserves to the full 10½-mile limit fixed by the Congress of the Lone Star Republic. His testimony before the Senate committee gives timely impetus to President Eisenhower's commitment to state ownership.

"All that remains now is for Congress to pass the bill quit-claiming title to the states, and there is no reason to doubt that this pro-administration Congress will do as much for the tidelands states as did the two previous groups that enacted similar measures over administration opposition, only to see them vetoed by President Truman."

Editorial in the Houston Post.

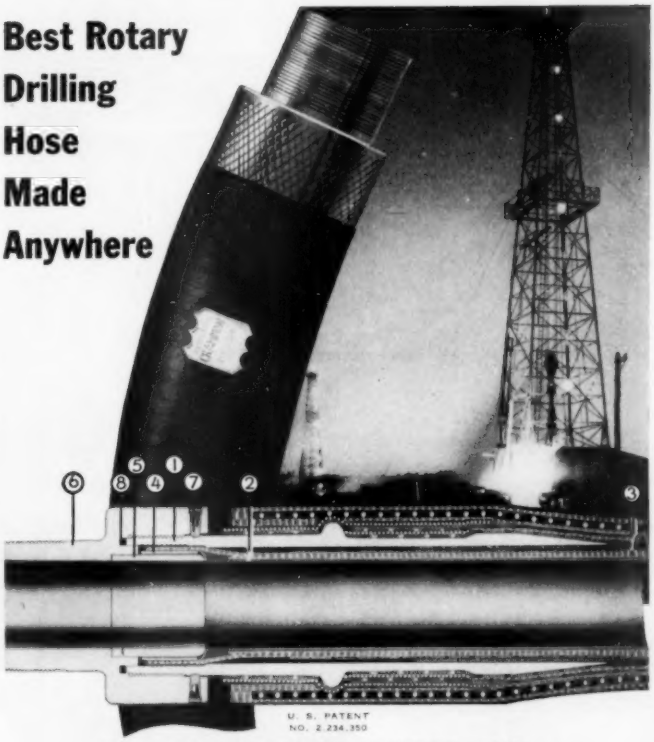
Production Agreements Essential

"Conservation of oil requires a consious, deliberate agreement to relate production to consumption. Whether this is called 'planning' or some other term, the result of agreed production must somehow be attained; uninhibited all-out competitive production would insure the most profligate and irresponsible handling of oil reserves. The American people would be the losers thereby, as in the past we have suffered grievous loss by just such irrational competition.

"But oil supply for this country is not a matter confined to the territorial limits of the United States. It is a world-wide matter. The same principles of conservation by rational production controls to match needs, are required as much on the world scene—perhaps more so—as domestically.

"It is therefore puzzling to the average citizen to find that in 1952 several of the principal oil producers of the United States were accused by the Government of constituting an illegal international cartel because, by an alleged agreement among them in years past, they sought to create some order in the development of world resources of oil, by a kind of production-consumption agreement that has long been recognized as essential. This attack upon these large American oil com-

Best Rotary Drilling Hose Made Anywhere



REPUBLIC CHAMPION HOSE with PATENTED BOLTLESS FULL FLOW COUPLING

● Republic's Champion Rotary Drilling Hose is a strong, flexible hose that's built to withstand severe shock and higher pulsating pressures.

Built-in steel muscles resist pressure, protect the hose against distortion. Oil-resistant Reprene throughout makes the hose practically immune to abrasion or deterioration from oil contact.

Champion Rotary Drilling Hose is available in standard lengths up to 60 feet. Type C Hose designed for 5000 psi test pressure, Type B for 4000 psi and Type A for 3000 psi. See your Republic Distributor or write direct for further information.

THE HIGHER THE PRESSURE . . . THE TIGHTER THE SEAL

In Champion Rotary Drilling Hose the nipple (1) is built in between the metal reinforcements of the hose carcass (2) and (3). The inner reinforced rubber structure (2) is anchored within the nipple and locked into leak-proof engagement by a brass expansion ring (4). This ring receives plenty of protection from the abrasive action of flowing grit by a special steel guard ring (5). As pressure pushes the reinforcing rubber structure (3) against the nipple assembly, a leak-proof union is established, and, **as the pressure continues to increase, the tighter the seal becomes!** Note that the cover cap (6) screws into position over the nipple assembly. It fits flush with the external diameter of the hose, leaving no projections to catch on the rigging or interfere with connections. The cap is held in position by submerged set screws and anchor cap seals (7). A rubber gasket (8) seals the joint between cap (6) and end of nipple (1).

MID-CONTINENT DISTRIBUTORS
Jones & Laughlin Steel Corporation, Supply Division
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Tulsa 2, Okla.

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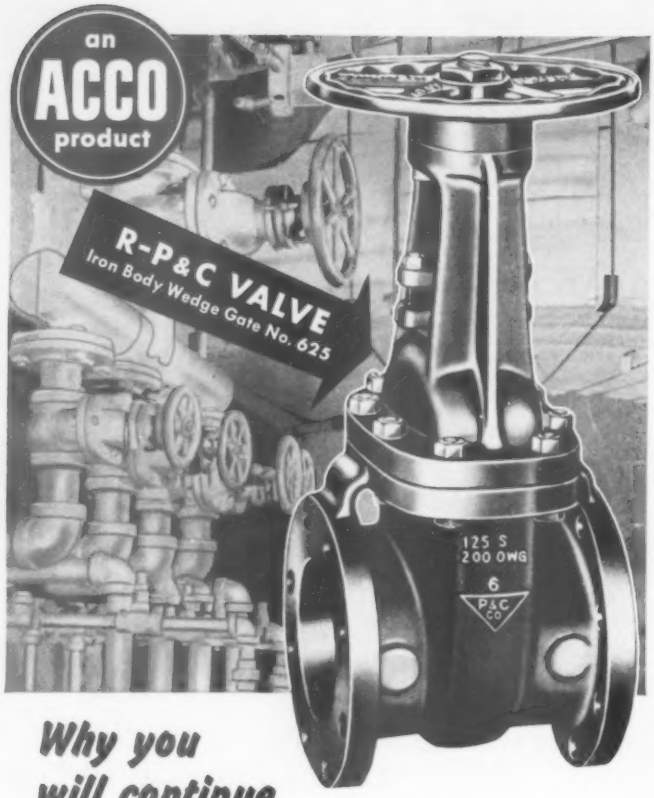
REPUBLIC RUBBER DIVISION
LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN 1, OHIO
INDUSTRIAL RUBBER PRODUCTS



Why you will continue to buy R-P&C iron valves...

● Because quality materials and high standards of workmanship insure long life and satisfactory performance.

R-P&C manufacturing controls from foundry to final test, together with the many years of accumulated experience of the workmen, are responsible for this high quality.

You get fine-grained, sound castings when you buy R-P&C Iron Body Valves. You get rod stock stems which have higher tensile strength. And you get the added strength of reinforcing tie ribs between bonnet and end flanges, plus ease of servicing because of separate yoke cap construction.

the Complete R-P&C line

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IRON
CAST STEEL
FORGED STEEL
BAR STOCK

● *All these features are yours, at no extra cost, when you buy R-P&C Iron Body Valves. See your local R-P&C distributor today or write us at Reading, Pa., for further information.*

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R-P&C VALVE DIVISION
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TRADE MARK

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R-P&C valves

panies as impairing competition is all the more difficult for the lay observer to understand, in view of the patently furious competitive rivalry between the major oil-refining companies in this country.

"It would be strange if as an outcome of this proceeding a dogma of unrestrained competition were to be arbitrarily required and enforced as to the world-wide development of oil resources, when the application of such dogma to the 'conservation' of domestic oil supplies has been so universally recognized as wasteful and against the public interest."

David Lilienthal, former head of the Atomic Energy Commission, in his new book, "Big Business, a New Era."

Big-Company Myth

"The big oil companies have been under a hot fire ever since the movement led by then Attorney General Price Daniel of Texas, now United States senator, was begun to prevent power-hungry bureaucracy from stealing properties that had belonged to the states and had been conceded to be their property in some instances for as long as a century and a half.

"It does no good to remind those who are continually harping on the alleged conspiracy of oil companies to exploit the oil resources under offshore waters of the states that the oil companies could do business with the federal Government just as easily as they can with the states."

Editorial in the Beaumont Enterprise.

Healthy Oil Outlook

"World petroleum consumption outside the United States has increased almost twice as fast as it has here. Now, when foreign consumption amounts to almost two-thirds of the United States consumption, the large percentage demand increases in foreign countries are beginning to have a very definite effect on total world demand. It is a healthy sign."

L. F. McCollum, president, Continental Oil Co., addressing the Permian Basin Ex-Student Association of the University of Texas, Midland.

CALENDAR OF EVENTS

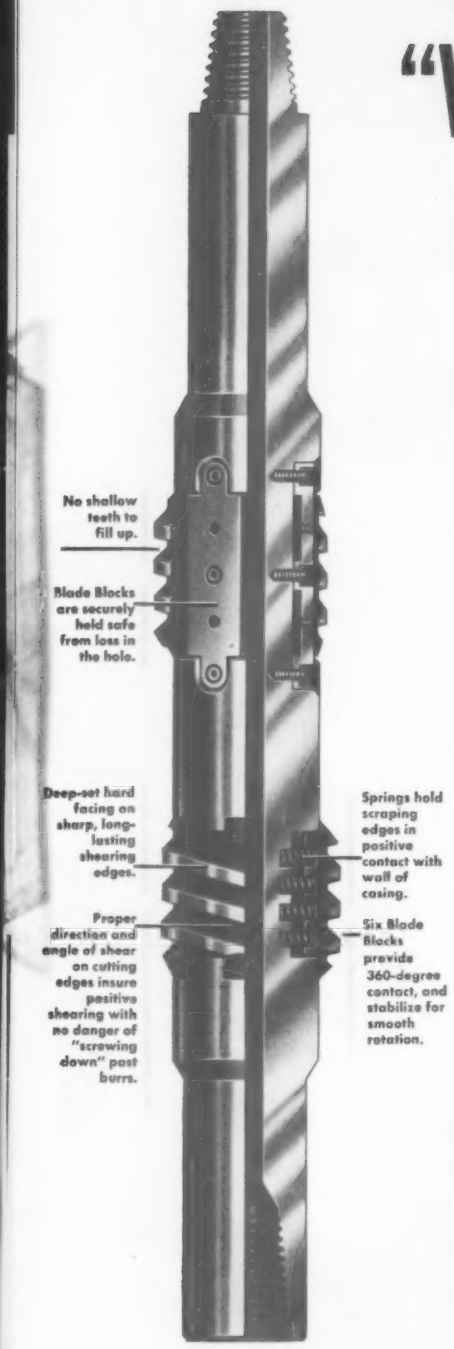
MAR.

18-20 American Petroleum Institute, division of production, Mid-Continent district meeting, Mayo Hotel, Tulsa.

23-25 Western Petroleum Refiners Association, annual meeting, Plaza Hotel, San Antonio, Tex.

For Economical, Dependable
Rotation of Your Drilling String
USE AMERICAN IRON
Hex or Square
KELLYS!
HEX KELLYS
American Iron Hex Kellys are made from fully heat treated alloy steel forgings for longer wear and greater resistance to torsional stresses. Driving surfaces are machine finished—and circulation holes precision bored—for smoother running and proper balance at all drilling speeds. Our manufacturing processes and scientific inspection insure straightness, joint alignment, concentricity of bore, hardness and precision threaded connections.
SQUARE KELLYS
American Iron Square Kellys are also made from a heat treated one piece alloy steel forging with top and bottom integral upset ends formed during the forging operation. The radius on the square of the driving surface is correctly formed during the forging operation. Correct forging processes plus straightness, joint alignment, concentricity of bore, hardness and precision threaded connections, make the American Iron Square Kelly the best balanced square kelly available.
BALANCED
FOR SMOOTH
RUNNING
at all
drilling speeds
AMERICAN IRON & MACHINE WORKS CO.
MANUFACTURERS OF
A
OIL FIELD EQUIPMENT
OKLAHOMA CITY U.S.A.

How is the
"Working Surface"


No shallow teeth to fill up.
Blade Blocks are securely held safe from loss in the hole.
Deep-set hard facing on sharp, long-lasting shearing edges.
Springs hold scraping edges in positive contact with wall of casing.
Proper direction and angle of shear on cutting edges insure positive shearing with no danger of "screwing down" past burrs.
Six Blade Blocks provide 360-degree contact, and stabilize for smooth rotation.

Baker Model "C"
ROTO-VERT Casing Scraper
Product No. 620-C

Unless the inside of your casing—the vital "working surface"—is clean and smooth, there is always a possibility of trouble in future operations. Burrs from gun-shot perforations, hardened cement or mud, and even mill scale are all dangerous when the time comes to run testers or swabs, or to set cement retainers or packers of any description.

The Baker Model "C" ROTO-VERT Casing Scraper removes all obstructions from the inside of the casing, leaving it clean and smooth. Burrs or imbedded bullets are sheared away; cement, mud and scale are scraped away, so that any down-hole work can be safely done at once, or during the years to come.

SCRAPE WHILE DRILLING OUT

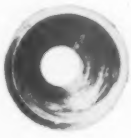
The ideal time to use the ROTO-VERT Casing Scraper is during the drilling out of cement, at which time it is run as a "follow-up" behind the bit. Thus in a single run you can also remove all hardened cement, mud, burrs and scale which might *later* damage swabs or testers, and cause packers or retainers to set prematurely—or never set at all.

EASY TO RUN—LOW-COST RENTAL

The Baker ROTO-VERT Casing Scraper is simple to run, and will effectively clean the inside of the casing when either reciprocated or rotated.

No service man is required, and the low rental cost is paid for many times over by freedom from future damage to bailers, swab rubbers and packers, as well as by the elimination of future delays and re-running expense.

SEE HOW THIS BURR... ripped this packing element,



and how ROTO-VERT could have prevented the damage by shearing away the burr.

# of your casing?

WHY THE ROTO-VERT IS SAFE AND SIMPLE TO USE AND COSTS LITTLE TO RUN

This helix-blade-type scraper can be either "spudded" (reciprocated vertically) or rotated for the removal of gun-perforation burrs, imbedded bullets, cement sheath or other obstructions from the inside of the casing.

The body is machined from bar stock, with two sets—a total of six—rugged Blade Blocks positioned for overlapping, 360-degree scraping coverage. The most outstanding feature of the Blade Blocks is the direction and angle of shear of the scraping edges. The slant of these scraping surfaces is in a direction OPPOSITE from that encountered on other helix-blade-type casing scrapers, and the shearing edge is set at a smaller angle from the horizontal. These features result in the fact that the ROTO-VERT will not "screw" down past burrs as it is being rotated. And when it comes to removing cement sheath or other casing coatings, you are assured of actually removing the material with the ROTO-VERT, instead of merely cutting threads in it.

REMOVING PERFORATION BURRS AND BULLETS

On rotary rigs best results are obtained by first running the ROTO-VERT Scraper *completely through* the perforated section WITHOUT ROTATION. This initial run will either shear or knock off the majority of imbedded or projecting bullets, and shear away most of the ragged perforation burrs. Then pull back the ROTO-VERT Scraper and rotate it through the perforated section. This second run permits the helix scraping edges to shear to their fullest extent, leaving perforation holes practically flush with the casing I.D., and the entire perforated section clean and restored to gauge.

When running the ROTO-VERT on tubing, or on a wire line (with suitable sinker bars and jars) it is merely run through the perforated section, then pulled back and run through again. If the ROTO-VERT runs through the perforated section smoothly (as indicated by checking the weight indicator) complete burr and bullet removal is a certainty.

REMOVING CEMENT SHEATH, HARDENED MUD OR SCALE

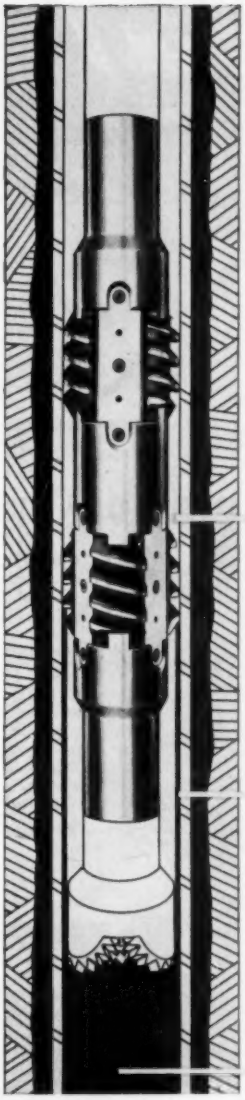
Recommended procedure is to install the ROTO-VERT just above the bit when drilling out cement, to remove the thin sheath of cement always left, even though a maximum gauge bit is being used. Hardened mud, cement, paraffin, or mill scale are completely removed in a single run.

On old wells (or when rotary equipment is not present) the ROTO-VERT, run on tubing, will successfully remove various casing coatings WITHOUT ROTATION. A spudding action usually quickly clears up any rough or stubborn "tight spots."

A modified ROTO-VERT can be furnished to operate with equal success when run on a wire line equipped with sinker bars and jars.

BAKER OIL TOOLS, INC.

HOUSTON • LOS ANGELES • NEW YORK



Even when a maximum gauge bit is used for drilling-out, a thin sheath of hardened cement remains to interfere with future operations. To visualize how ROTO-VERT removes this sheath, see left.

All cement, scale, burrs, etc., have been removed by the ROTO-VERT Scraper, and the vital "working surface" of casing is left clean and smooth.

This thin sheath of hardened cement always remains after the bit has passed.

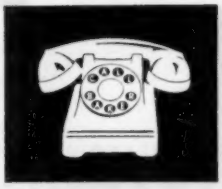
Cement to be drilled out.

Cross-section of casing showing gun-perforation burr, before scraping . . .

and after ROTO-VERT was run.

This brittle cement sheath prevents the slips of pack-off tools from gripping the casing.

. . . Here is cut section of the same casing showing how slips tried, unsuccessfully, to set against the cement sheath.



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for consultation and service on BAKER ROTO-VERT Casing Scrapers

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AA-51 Series Vented Type Explosion-Proof lighting fixture. Cooler operating ... easier to service.

1. Cool Temperatures. Appleton Explosion-Proof lighting fixtures operate cool enough to prevent igniting the gas, vapors or dust outside the fixture. Fluorescent fixtures operate at low, safe temperatures. Incandescent fixtures have full circle venting and porous metal interiors to disperse heat evenly and safely.

2. Flame-tight. Appleton Explosion-Proof MALLEABLE IRON conduit fittings and lighting fixtures are made tight to confine dangerous arcs, to prevent escape of flames or burning gases, or to cool escaping gases after an internal explosion. Flame-tightness is assured in that five full threads must be completely engaged before contact can be established. Accurately machined flat joints at cover openings assure perfect alignment.

3. Explosion-Proof. Appleton Explosion-Proof Equipment withstands at least four times the maximum possible internal pressures without bursting or loosening screws or joints. Fittings are made of unbreakable MALLEABLE IRON.

Type FSQX Explosion-Proof and Dust-Tight plug and receptacle with interlocking safety switch.

Type ARTC Explosion-Proof Tumbler Switch Unilet. Made of unbreakable MALLEABLE IRON, light and strong.

APPLETON
MALLEABLE
— IRON —
UNILETS

Type EFU Explosion-Proof fluorescent lighting fixture. Available for two 40 Watt, 48" lamps; or two 100 Watt, 60" lamps.

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23-26 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, and Society of Exploration Geophysicists, joint annual meeting, Sam Houston Coliseum, Houston.

23-27 Western Metal Exposition and Congress, technical sessions, Statler Hotel, Los Angeles.

25-27 Society of Automotive Engineers, national production meeting, Hotel Statler, Cleveland.

28 North Texas Oil and Gas Association, annual meeting, Kemp Hotel, Wichita Falls, Tex.

30-31 Texas Independent Producers and Royalty Owners Association, annual meeting, San Antonio.

APRIL

Apr. 1 Mid-West Gas Association, Broadmoor Hotel, Colorado Springs, Colo.

1- 9 American Association of Oilwell Drilling Contractors, eighth annual drilling industry safety clinic, Baker Hotel, Dallas.

7- 8 American Gas Association, research and utilization conference, Hotel Statler, Cleveland.

7- 9 Petroleum Industry Electrical Association, annual convention and exhibit, Shamrock Hotel, Houston.

8- 9 American Association of Oilwell Drilling Contractors, eighth annual drilling industry safety clinic, Baker Hotel, Dallas.

8-10 American Petroleum Institute, division of production, Eastern district meeting, William Penn Hotel, Pittsburgh.

13-15 American Society of Lubricating Engineers, eighth annual meeting, Hotel Statler, Boston.

15-17 National Petroleum Association, mid-year meeting, Cleveland.

20-22 American Petroleum Institute, Division of Transportation, products pipe-line conference, Hotel Muehlebach, Kansas City.

21 Association of Consulting Chemists and Chemical Engineers, Inc., Hotel Belmont Plaza, New York City, symposium and dinner.

21-23 Southwestern Gas Measurement Short Course University of Oklahoma, Norman.

22-24 American Association of Petroleum Geologists, Rocky Mountain section meeting, Casper, Wyo.

22-24 American Institute of Electrical Engineers, southern district meeting, Hotel Seelbach, Louisville, Ky.

24-25 Interstate Oil Compact Commission, spring meeting, Roosevelt Hotel, New Orleans.

26-29 American Institute of Chemical Engineers, Chemical Institute of Canada, joint meeting, Royal York Hotel, Toronto, Ont.

27-28 Independent Petroleum Association of America, mid-year meeting, Jefferson Hotel, St. Louis.

APRIL 27-MAY 1 American Petroleum Institute, safety and fire protection committees sixth mid-year meeting, Galveston, Tex.

Apr. 29-May 1 Natural Gasoline Association of America, annual convention, Rice Hotel, Houston.

Apr. 30-May 1 American Gas Association, transmission and storage conference, Edgewater Beach Hotel, Chicago.

MAY

4- 5 American Petroleum Institute, division of marketing, midyear meeting, Baker Hotel, Dallas.

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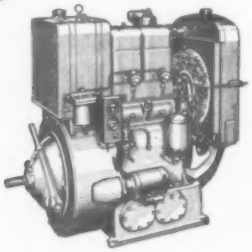

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No "9 to 5" routine for Nordberg "4FS" series Diesel engines . . . they're built to stay on the job around the clock—day in and day out. Using sturdy, heavy duty construction throughout, these conservatively rated units are your best buy for the toughest kind of power jobs . . . in construction, oil field, irrigation, power plants, marine service and scores of other power requirements.

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Send catalog covering Nordberg Type 4FS Diesels. I am interested in a unit for the following service:

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Your Name _____

Company Name _____

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4-153

4- 6	Liquefied Petroleum Gas Association, annual convention, Conrad Hilton Hotel, Chicago.
5- 6	Gas hydrate control conference, University of Oklahoma, Norman.
6- 8	American Society of Training Directors, ninth annual conference, Sheraton Plaza Hotel, Boston.
7- 8	American Petroleum Institute, Rocky Mountain district, Division of Production, spring meeting, Gladstone Hotel, Casper.
11-13	Southern Gas Association, Jung Hotel, New Orleans.
11-14	American Petroleum Institute, Division of Refining, midyear meeting, New York.
13-14	Pacific Coast Gas Association, annual gas supply and transmission conference, Santa Barbara, Calif.
14-23	International Petroleum Exposition, Tulsa.
15-16	International Gas Union, council meeting, Paris, France.
19-22	The Institute of Gas Engineers, ninetieth annual meeting, London, England.
21-23	Panhandle Geological Society, field trip, Yucca Hotel, Raton, N. M.
24-27	American Gas Association, production and chemical conference, Hotel New Yorker, New York City.
25-29	American Society of Mechanical Engineers, annual conference and exhibit, oil and gas power division, Hotel Schroeder, Milwaukee.
27-29	Texas College of Arts and Industries, Kingsville, eighth annual short course in gas technology.
28-29	Western Petroleum Refiners Association, regional technical-industrial relations meeting, Broadview Hotel, Wichita.
28-29	Natural Gas and Petroleum Association of Canada, London, Ont.
29-30	West Texas Geological Society spring field trip, Paisano Hotel, Marfa, Tex.

JUNE

2- 3	American Petroleum Institute, Division of Production, Pacific Coast District, Statler Hotel, Los Angeles.
4- 5	Kentucky Oil and Gas Association, annual meeting, Lafayette Hotel, Lexington, Ky.
7-12	Society of Automotive Engineers, summer meeting, The Ambassador and Ritz-Carlton Hotels, Atlantic City, N. J.
14-18	Canadian Gas Association, Windsor Hotel, Montreal, Canada.
15-19	American Petroleum Institute, Division of Production, midyear committee conference, Hotel William Penn, Pittsburgh.
16-19	American Welding Society, national spring technical meeting, Shamrock Hotel, Houston.
JUNE 16-JULY 2	Intensive Course and Research Conference on Phase Behavior of the Hydrocarbons, University of Michigan, College of Engineering, Ann Arbor.
18-19	Western Petroleum Refiners Association, regional technical-industrial relations meeting, Conrad Hilton Hotel, Chicago.
18-19	Pennsylvania Grade Crude Oil Association, annual meeting, Hotel William Penn, Pittsburgh.
JUNE 29-JULY 3	American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

COMPLETELY ROTPROOF

Styles illustrated
50-00 Jacket 51-00 Pants 53-00 Hat

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Also: Three-quarter and long coats, coveralls and many other styles. All clothing made in black and yellow.

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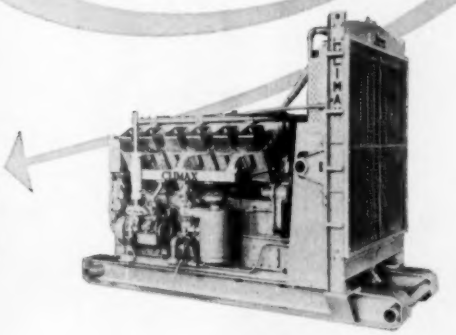

Stewart & Stevenson Services has been named Texas Distributor for *Climax* Blue Streak engines

Addition of this new line of engines completes the range of power requirements for Texas industries now supplied by Stewart & Stevenson. And Climax Blue Streak Engines will be backed by the same sales and service facilities and the same guarantee that have helped Stewart & Stevenson to become the nation's largest distributors of General Motors Diesel Engines. Climax engines will make available to natural gas or butane users throughout Texas a complete range of fine engines up to 600 horsepower. The engines will be sold and serviced by all Stewart & Stevenson branches. Your Stewart & Stevenson representative will be glad to give you complete details on how Climax Blue Streak Engines will fill your power requirements.

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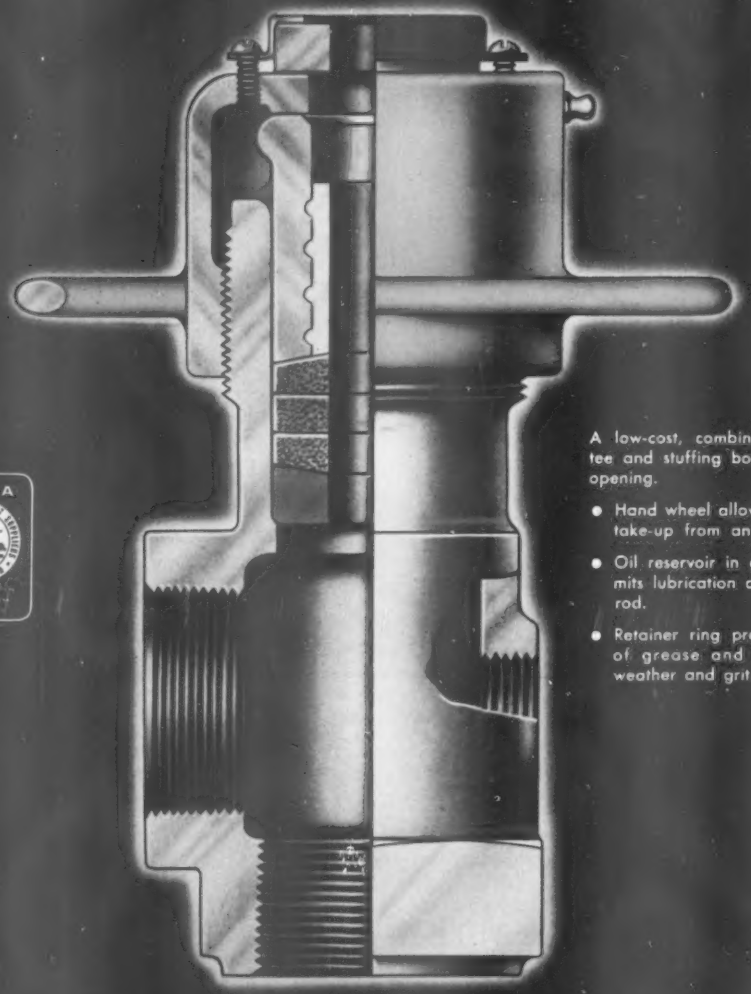

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- Oil reservoir in gland permits lubrication of polished rod.
- Retainer ring prevents loss of grease and seals out weather and grit.

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JOURNAL
TULSA, OKLAHOMA

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JOURNALLY Speaking

Vital Statistics

THE year 1952 was good to oil men, at least so far as vital statistics are concerned. Oil men lived longer last year than in 1951—if our personal index of longevity can be trusted.

Our index is based on the obituary notices carried in the Journal. During 1952 we reported 549 deaths, of which 441 were men whose ages were known and who could be classified into one of five broad occupational groups directly in the oil industry. The average age at death of these 441 was 63.3 years. A similar compilation of 1951 obits showed the average age at death that year was 62 years *(Journally Speaking, February 18, 1952, page 83).*

This indicates that oil men are living 1.3 years longer. However, oil men still aren't living as long as the average American male, for various indexes and actuarial tables place the life expectancy at from 67 to 71 years for men in this country.

The most hazardous occupations in the petroleum industry are not what you would expect. They are the white-collar jobs, according to our calculation. The obits on men in such office jobs as treasurers, secretaries, purchasing agents, accountants, public-relations men, and employes of land, lease, and legal departments averaged out to 58.6 years.

The next most dangerous jobs are in the scientific category—engineers, geologists, physicists, chemists, and research workers. Their average age at death last year, as recorded in our pages, was 60.9 years.

The tin-hat boys were right in the middle of the five groups. By this we mean operating men such as foremen, superintendents, drilling contractors, pipe liners, drillers, oil-field workers, and others who normally spend a good portion of their time around machinery and equipment in the field or in the plants. They died at the average age of 62 years in 1952.

You might think that the management class would live the longest, the executives with their plush offices, bankers' hours, and plenty of social activity. But last year these men dropped off at the average age of 65.3 years.

The greatest longevity in the industry is possessed by independent operators and producers. They didn't quite manage to make their allotted "three-score years and ten," for their average age at death was 68 years, but they did manage to stick around this vale of tears longer than men in other occupations in the industry.

We don't claim that this longevity index is actuarially sound. In fact, we don't claim that it proves anything at all. The only conclusion we are able to draw from it is that it pays to be independent.

Rest in Peace

HONEST, we didn't intend to make this page completely morbid, but it just so happened that the very next thing we picked up after writing the above also has to do with death and oil.

It's a clipping about a 2-acre cemetery in Washington County, Oklahoma, leased by Carter Oil Co. as part of an operating unit being set up for water flooding. The county, which gave the lease, stipulated that there be no drilling in the hallowed precinct, but that doesn't bother Carter because the water flood will sweep under the cemetery many hundreds of feet below the resting places of the departed.

The county will collect the royalty and pocket it without attempting to have it allocated among the occupants of the plots or their heirs or assigns, thus relieving Carter of what could have been a rather difficult job of figuring division orders.

So oil men die, but oil's progress goes on. And if any old-time oil men are buried in that cemetery, their spirits may be amazed at this new-fangled way of washing oil out of the ground—and from a field which was believed to be dead before they were.

—Henry D. Ralph

YOU CAN SAVE CASING

BY STAGE CEMENTING THE BAKER WAY

With *only one* string of casing you can cement off at the shoe *and* shut off surface water. Or you can cement a well with *two producing zones* and be assured of a good cement job for the upper zone. And you *never* need risk breaking down a comparatively weak formation by high cementing pressure and the extreme weight of a long cement column.

IT'S SIMPLE, SPEEDY AND SAFE to perform two-stage cement jobs with Baker Stage Cementing Collars (Product No. 200-F) in combination with other Baker Equipment. In addition to positive, mechanical closing of the cementing ports upon completion of the second stage, you are assured of these outstanding advantages:

1. After the second stage has been completed, an external steel sleeve with an oil-resistant synthetic rubber seal provides positive closure and prevents passage of fluid between the inside and the outside of the casing, regardless of the condition of the cement job at that point.

BAKER STAGE CEMENTING COLLAR

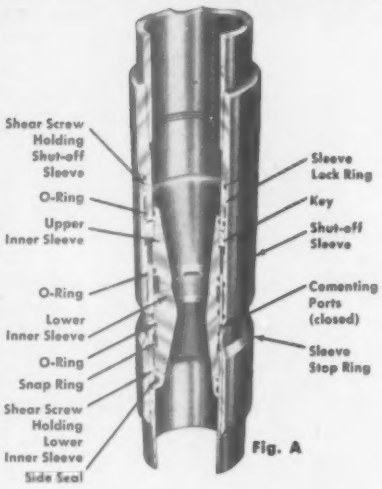

Fig. A

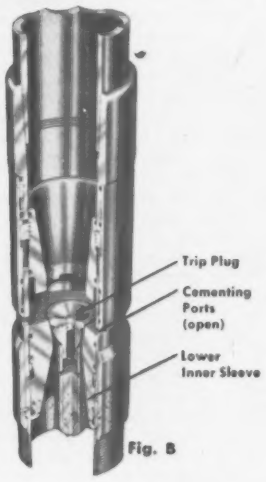

Fig. B

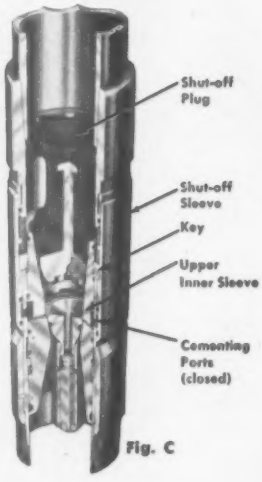

Fig. C

Fig. A—Ready for cementing the first stage. The cementing ports are covered by the Lower Inner Sleeve which is held in position by shear screws; shear screws also hold the Shut-Off Sleeve above the cementing ports.

FIG. B—Ready for cementing the second stage. After the Trip Plug is seated, application of hydraulic pressure shears the screws holding the Lower Inner Sleeve which moves downward, thus uncovering the cementing ports. The Trip Plug prevents passage of fluid into the casing below, and cement pumped into the casing will now pass through the cementing ports for the second-stage cementation.

FIG. C—Second-stage cementation is completed. The Shut-Off Plug has been pumped down the casing and pressure applied to shear the screws and move the Shut-Off Sleeve downward to close off the cementing ports. Note how the Sleeve Lock Ring has expanded to lock the Shut-Off Sleeve in position permanently covering the cementing ports.

2. The cementing ports of the Stage Cementing Collar may be opened at any time after completion of the first stage, and fluid may be circulated through the stage collar for any desired length of time before starting second-stage cementing.
3. Operation of the stage collar is effected by fluid pressure applications only, and no movement of the casing is required after the first stage of the cementation has been completed.
4. All internal parts of the Baker Stage Cementing Collar are constructed of readily drillable materials, and when drilled out there are no sharp shoulders or irregularities to interfere with the subsequent passage of tools through the collar.
5. Since the steel Shut-off Sleeve is on the outside of the Stage Cementing Collar, there is no possibility of accidentally opening the cementing ports when drilling out the internal mechanism, or later when bits or casing scrapers are run through the collar.

Ask any Baker representative or office for recommendations to make your stage cementing operations successful, "first-time" accomplishments.

BAKER OIL TOOLS, INC.

HOUSTON • LOS ANGELES • NEW YORK

We can do something about oil taxes

MID-MARCH is tax time for most people, and a good time to talk about the kinds and amounts of taxes the oil industry pays.

Fortunately a great many people are talking about taxes these days, including the people in Washington and state capitals who impose and spend the taxes. There is general agreement that taxes are too high and that they must be reduced just as fast as spending can be curbed.

Then comes the question of which taxes will be cut and how much, and how the remaining levies can be simplified and made more equitable. Everybody will get into the act, with the oil industry, along with every other taxpayer, clamoring for a slice of cake.

TO prevent the tax cutting from becoming a political Donnybrook, the oil industry could well take the initiative in proposing a sound plan or series of plans for scientific taxation of its activities and its products. This would be particularly appropriate as applied to state taxation, for there are few federal taxes specifically on oil.

Several state legislatures currently are looking to the oil industry for additional revenue, including some where the oil industry is relatively new. In all such cases the oil industry dutifully says it wants to pay its fair share, but there seems to be no complete agreement on how big a share is fair and even less on what types of levies are the most equitable.

Out of the varied experience with severance taxes, production taxes, and all the others, it should be possible to frame something like a "model" tax structure, just as there is a model conservation law for the guidance of state legislatures. Such a formula might never be adopted entirely by any state, but the mere existence of a set of principles which the industry has found acceptable or even workable would be a big step toward equitable treatment.

TAXATION has been defined as the art of plucking the most feathers with the fewest squawks from the goose. Legislators face the dilemma of providing enough revenue without making too many political enemies, but all too often they are without adequate guidance as to the most productive, efficient, and equitable methods of taxation.

If the oil industry blindly fights every tax proposal, or remains silent when tax revision is under consideration, it can have little real complaint if the resulting law is based on political rather than economic considerations. But a constructive tax plan backed by sufficient factual data to allay suspicions of political skulduggery would be welcomed by most legislators.

The oil industry is trying hard to build a reputation as a "good citizen." Part of a good citizen's obligation is to make constructive suggestions for sound fiscal administration of his government.

ANCHOR

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- PROPANE
- NATURAL GASOLINE
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- NAPHTHA
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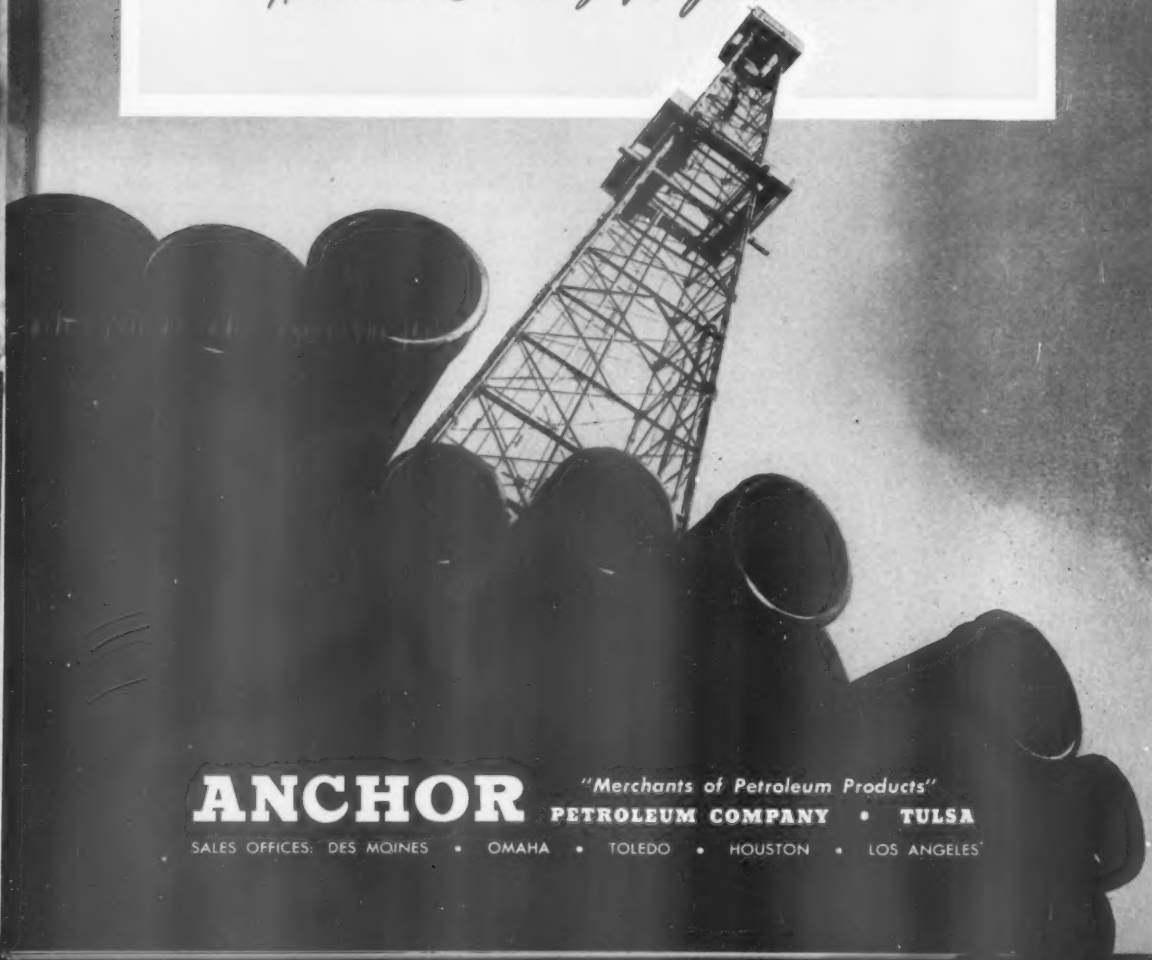
We're shooting for your business! We want to serve as your dependable supplier or as your marketing department. That's our specialty. We can give you more time for your specialty by handling all your marketing-transportation problems. Our fleets of tank cars are ready to deliver or pick up petroleum products right at your "door." You can have more time for your business, make more money, maybe have more time for leisure fun if you'll call in the specialists in petroleum marketing—that's us—Anchor Petroleum Company—2-7261, Tulsa.

And we're Shooting for Your Business



ANCHOR *"Merchants of Petroleum Products"*
PETROLEUM COMPANY • TULSA

SALES OFFICES: DES MOINES • OMAHA • TOLEDO • HOUSTON • LOS ANGELES

THIS WEEK

TECHNOLOGY. — Development of new instruments points to use of infrared analysis in refinery process units. . . . New equipment would continuously analyze a process stream, recording data governing control of process variables such as temperature, pressure, flow rate, recycling ratio, and others. . . . ¶Field measurement of corrosion in pipe lines and vessels expected soon as a result of development of new equipment. . . . Tests of new portable unit indicate it can measure extent of corrosion and determine whether laminations, inclusions or density flaws exist. . . . Equipment is adaptation of immersed ultrasonic inspection equipment. . . .

INTERNATIONAL.—Italian court in Venice rejects Anglo-Iranian Oil Co.'s request for an injunction impounding about 31,000 bbl. of fuel oil exported from Iran in January in the tanker Miriella. . . . ¶Company immediately institutes proceedings before the Tribunale di Roma in Rome for a full legal determination of the ownership question. . . . ¶Kuwait Oil Co., Ltd., strikes oil on the Ahmadi Ridge northeast of Burgan field in Kuwait. . . . Further drilling suspended pending additional seismograph work. . . . ¶Egypt decrees new petroleum law removing two biggest blocks to resumption of foreign oil operations in the country. . . . ¶Two main operating companies wait for settlement of price for oil sold on Egyptian market. . . . ¶Process units arriving at site of Standard-Vacuum's new 15,600-bbl. plant at Durban on eastern coast of Union of South Africa. . . .

A MAJOR GAS PLAY in South Central Utah commands exploration interest in the Rocky Mountain region. Pictured above is one of the recently completed gas wells in the Clear Creek field of Carbon County, Utah, 90 miles southeast of Salt Lake City; here Three States Natural Gas Co. and associates have completed eight wells to prove up more than 3 trillion cubic feet in Cretaceous sandstone reservoirs. Last week, there were an even dozen exploratory wells drilling throughout the Wasatch Plateau region in search of similar reservoirs.

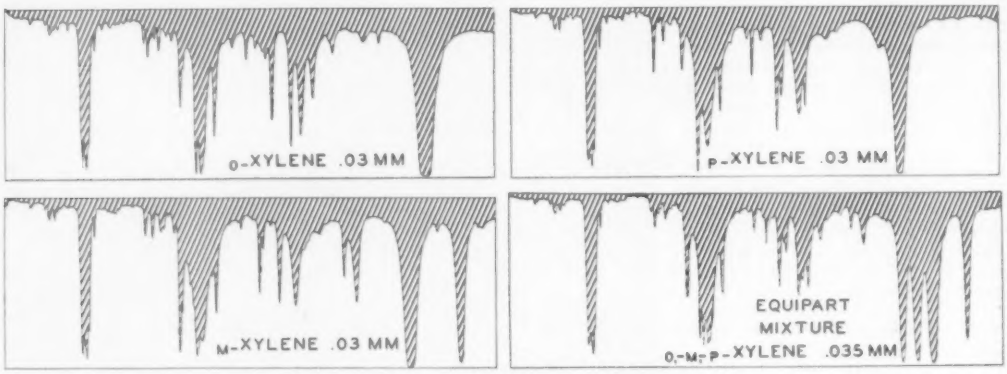
RESERVES.—Proved reserves of liquid hydrocarbons were at an all-time peak on January 1, A.P.I.-A.G.A. committee reports. . . . Increase during 1952, however, was smallest since 1947, group says. . . . Total reserves at beginning of year estimated at almost 33 billion barrels, a gain of about 765,000,000 bbl. over 1951. . . . Increase was made in spite of record production of more than 2.5 billion barrels during last year. . . .

ACTIVITY.—Production of crude and lease condensate averaged 6,466,350 bbl. daily for the week ended March 7, down 63,425 bbl. daily. . . . ¶Total well completions for the week increased 29 wells to 865. . . . ¶Wildcat completions were up 17 wells to 196. . . . ¶Rotary rigs operating in United States on March 9 totaled 2,450, an increase of 22 rigs for the week. . . .

TRENDS.—Primary stocks of major products on March 7 were 25,900,000 bbl. greater than a year earlier compared with spreads of 19,700,000 bbl. at the end of December and 15,500,000 on September 30. . . . Most of the gain has been on the East Coast and West Coast. . . . West Coast stocks are up 9,300,000 bbl. and East Coast inventories are 14,400,000 bbl. larger. . . .

PIPE LINES. — Wilcox Trend Gathering System, Inc., pushes work in South Texas on nation's longest wet-gas gathering system. . . . The $10,000,000 project, comprising 157 miles of 14 and 16-in. main line from Hagist field in Duval County to Provident City in Lavaca County, is scheduled for completion May 1. . . . ¶Texaco begins installation of extensive facilities to gather, compress, and transport natural gas from Terrebonne Bay and adjacent areas in South Louisiana. . . . ¶Proposed bill which would force pipe-line firms to lay lines to any oil field and require crude purchasers to buy the oil stirs up controversy in Oklahoma. . . .

GOVERNMENT.—Navy announces it is withdrawing from exploration operations in Alaska, abandoning wildcat program aimed at developing production in northern part of country. . . . Savings to Government set at $25,000,000 or more. . . . ¶Navy plans to increase drilling, step up production in Elk Hills field approved. . . .



INFRARED SPECTRA of ortho, meta, and paraxylenes and of an equipart mixture.

New Control Tools

Fully automatic plant operation hinted in development of instruments using infrared analysis to check plant stream

George Weber

NORWALK, Conn. — The infrared analyzer, long a familiar tool in the laboratory, is now going into the plant.

This new step toward what has been called the "Analyzer Age" of process control, was taken recently by Perkin-Elmer Corp. of Norwalk, in announcing two new instruments designed for installation on process units.

According to Perkin-Elmer's vice president, Dr. Van Zandt Williams, the petroleum refinery industry, with its progressive approach to process-control problems, represents the major potential field for these new instruments. A number of refiners now are investigating the possible application of such instruments in distillation, alkylation, isomerization, catalytic cracking, and catalytic reforming operations.

Hydrocarbon "fingerprints" . . . Infrared analysis of gas or liquid streams is an established laboratory tool. When light rays in the infrared band are passed through a hydrocarbon mixture, certain wave lengths of light are absorbed. Each component shows an absorption band which is different from that of any other. Moreover, the band varies with the amount of each component present. Thus a "fingerprint" may be obtained which detects not only the presence but the concentration of any selected hydrocarbon, regardless of the presence of other components.

The absorption bands differ for isomers of the same molecular weight and for the presence and positions of double bonds, hydroxyl groups, etc. These spectral characteristics are retained on mixing several components so that it is possible to measure the absorption spectra of the mixture, choose absorption bands characteristic of each component, and analyze for the component concentrations present. The accompanying figure illustrates this variable absorption by three xylene isomers of the same molecular weight.

Stream analysis . . . Perkin-Elmer will widen the use of this technique by taking it out of the laboratory and adapting it to direct analysis of unit streams. There it will continuously analyze a sample bypassed stream and record the desired data either at the unit or in the control room. The resulting electrical signal can be used for concentration indication or direct control of such process variables as temperature, pressure flow rate, recycling ratio, reflux ratio, etc.

"Although the potentialities of infrared for process control have been evident in results from the laboratory spectrometer," says Perkin-Elmer, "the development of process instruments has necessarily been slower for two reasons. A major retardant has been that the instruments must perform to about the same ultimate limits as the laboratory spectrometer yet to do so continuously under extreme conditions of atmospheric corrosion, mechanical vibration, and wide ambient temperature variation. Secondly, there are two quite different instrument principles—dispersion and nondispersion—that might be used, and each has certain advantages and disadvantages.

"Under these circumstances, Perkin-Elmer Corp., as a result of considerable experience with laboratory spectrometers, has initiated fundamental development of instruments that are designed specifically to meet plant requirements. In order to insure the best possibility of handling any process problem, two instruments will be available — the Model 93 Bichromator Analyzer, using the dispersion principle, and the Model 105 Tri-Non Analyzer, using the nondispersion principle. Each is rigidly constructed to meet vibration specifications, thermostated to 150° F. for operation from 0° F. to 120° F. ambient, and is available in an explosion-proof case designed to meet Class I Group D safety requirements."

Engineer advisors . . . To insure the best application of these new instruments, the company maintains teams of qualified chemical and instrument engineers who analyze particular refiners' problems and recommend instrument adaptation. These groups are now at work on a number of potential applications submitted by oil and chemical companies in the form of data sheets. These sheets outline the processor's stream condition and what analysis he desires. They list constitution of the stream, component to be measured, the concentration or range of concentration to be measured, the accuracy desired, other components in the stream, tem-

perature, pressure, dew point, corrosive characteristics and presence of suspended solids, and the installation and instrument sensitization and specification requirements.

Individual attention to each potential application of these new instruments will require several months of research. The Tri-Non Analyzer is expectel to be in production by December, and the Bichromator Analyzer will be produced sometime early next year. Both offer the refiner a new dimension in studying unit operation—the direct continuous measurement of concentration of any selected component in a plant stream.

To date, most refiners appear interested in using the instruments to control distillation operations by signalling or energizing controls when some selected hydrocarbon appears in a side stream in a predetermined concentration. This cut-point control keyed to some specific component can also be used in analyzing or controlling the operation of any of the conventional processes employed in petroleum refining.

Spot-Checking Corrosion

Tests indicate immersed ultrasonic inspection may be used to find and determine extent of damage to field facilities

D. H. Stormont

LOS ANGELES.—Adaptation of immersed ultrasonic inspection equipment to field usage soon may result in a new tool for determining in the field the extent of corrosion inside pipe lines and vessels and for inspecting pipe-line welds.

First tests of a make-shift portable unit recently were carried out at the Taft compressor station of Southern California Gas Co. The equipment demonstrated it could rapidly detail how much corrosion had occured, and whether laminations, inclusions, or density flaws existed in either the metal or weld.

Immersed ultrasonic units have been used for years in the aircraft industry for the detailed inspection of turbine rotors and other highly stressed parts in which internal flaws could lead to early failure. In this usage the part inspected generally is immersed in a stationary water tank.

At the recent test the inspection equipment was mounted in a station-wagon and moved from point to point in the yard, checking above-ground mains and headers and the walls of gas scrubbers. Electric power was supplied by a portable generator. In place of an immersion tank a stream of water impinging on the metal surface served as the means for transmitting the high-frequency sound waves between the metal and the scanning crystal. Such a "connection" is necessary, since the waves will not travel even minute distances through air without servere attenuation.

The survey was conducted by D. C. Erdman, president and chief engineer of Electro Circuits, Inc., Pasadena, one of the developers of the immersed ultrasonic inspection technique. Generally a 15-mc. crystal was employed in the scanning unit, which was held to the

CROSS-SECTION VIEW of the gas-scrubber wall under the scanner is studied by D. C. Erdman, Electro Circuits, Inc., on the television-type screen. Traversing the scanner is Chris Sato, technical assistant.

sides of vessels and lines by means of a carriage equipped with magnetized wheels. Sonic beams of 5, 10, 20, or 25 mc. could have been used, depending upon the type of defect looked for.

How corrosion is detected . . . Once proper alignment conditions were established at each test point, cross-section views of the metal beneath the scanner were shown instantaneously on a television-type cathode-ray tube. As the scanner was traversed along the pipe or vessel, corrosion pits, changes in wall thickness and any defects in the metal which cause a change in density were observed readily on the screen. The image persisted for several seconds on the new type phosphor screen, so that, while the scanning crystal was being moved at relatively rapid speed, even momentary indications could be noted clearly.

When severe corrosion or other defects showed on the screen, the image was photographed. These photographic records, as well as a comparison of data gained from cutting up and visually inspecting some of the pipe, are to be discussed at the April technical services conference of the Pacific Coast Gas Association.

CANADA

Montreal to Expand Again

MONTREAL.—A second round of postwar expansion is coming up for Imperial Oil, Ltd.'s Montreal East refinery. According to Charles Scrymgeour, general superintendent, about $10,000,000 will be invested in new facilities, for completion in early 1954.

Crude charging capacity will be increased from 46,000 to 58,000 bbl. per day by the addition of a new atmospheric and vacuum distillation unit and a vacuum pipe still. The 12,000-bbl. per day fluid catalytic cracking unit, first of its kind in Canada, will be enlarged by the addition of certain auxiliary facilities.

Cumene Production Begun

MONTREAL, Que.—Cumene production has commenced at British American Oil Co.'s Montreal East refinery. The petrochemical is now being stockpiled awaiting the completion of the B.A.-Shawinigan, Ltd., phenol and acetone plant which will go on stream this spring.

The new all-Canadian operation, costing more than $3 million, will produce an estimated 21 million lb. of phenol and acetone annually. In British American's modernized 40,000-bbl. refinery, propylene is separated from other light olefins in the gas-recovery system serving the fluid catalytic cracking unit. This hydrocarbon is reacted with benzene derived from Shawinigan to produce cumene or isopropyl benzene.

The cumene will comprise the principal raw charge for the joint B.A.-Shawinigan operation, where it will be oxidized to cumene hydroperoxide which in turn will be concentrated and split to form phenol and acetone. The new plant will represent the first commercial application of the process licensed from Hercules Powder Co. of Wilmington, Del., and Distillers, Ltd., of London, England. The M. W. Kellogg Co. through its subsidiary, Canadian Kellogg Co., Ltd., is building the new plant.

FIRST DERRICK to go up on the I.P.E. grounds was this one of National Supply Co., shown here being raised. One of the largest of its kind, the 147-ft. mast will be on exhibit with all of its auxiliary equipment near the main entrance.

UNDERWATER GRAVITY METER operated by remote control will be a feature of the Hall of Science exhibits at the 1953 show. W. T. Born, second from left, vice president of Geophysical Research Corp. and head of the geophysical subcommittee, calls attention of other members of his committee to the instrument panel. Others in the picture from the left are W. B. Agocs, University of Tulsa; C. B. Scott, Carter Oil Co.; and C. K. Ruddick, Schlumberger Well Surveying Corp.

I.P.E. Getting Ready

Two rigs already up, workmen busy erecting new buildings and remodeling old as opening date for oil show nears

Ted A. Armstrong

TULSA.—With opening day only 8 weeks away, exhibitors and exposition personnel last week were busy building and remodeling their structures on the grounds of the International Petroleum Exposition. The exposition this year will be open 10 days, May 14-23.

This year's oil show, the thirtieth anniversary of the first show held in 1923, will be by far the largest ever held, with more than 1,500 exhibitors showing their equipment to the petroleum industry and the public.

In sharp contrast to the 1923 show, when fewer than 50 equipment and service companies exhibited oil-industry materials and equipment valued at about $10,000, this year's oil show will display equipment expected to exceed $100,000,000 in value.

Space sold out . . . All space for the show has now been sold, William B. Way, general manager, announced last week, and participating companies already beginning to move in heavy-equipment displays.

The 1953 exposition will be spread over an area of about 26 acres, larger than the grounds of the last exposition, held in 1948. An increase in the size of the layout was dictated by the fact that 98 per cent of the 1948 exhibitors contracted for their space for the 1953 show, and many more exhibitors applied for space. The exposition acquired additional land on the north and west of the original grounds, and all space in these areas now has been contracted.

The four major exposition buildings contain 783 individual 10-ft. booths. In addition, about 40 companies have their own buildings on the grounds, and many others will use the unsheltered outdoor areas for their exhibits.

Some displays already were arriving last week, and two of an expected dozen or more derricks which will dot the grounds already had been erected. Several new buildings were under con-

SETTING 30-IN. CASING for the Lufkin Foundry & Machine Co. exhibit, which will feature a new type of hydraulic pumping unit. The hole was drilled by Bennett Drilling Co., which had to modify a cable-tool bit in order to pound out a 30-in. hole. The casing was specially fabricated. At right is John B. Shaw, owner of the drilling company.

HOW IT LOOKED in 1948 during the last exposition. This year it will be bigger, with the triangular space in the foreground and a strip of the parking area at left also devoted to exhibits.

struction, and renovation and remodelling of many buildings was under way.

"In interest, size, and quality of exhibits and in expected attendance, there is no doubt now that our thirtieth anniversary show will break every preceding record," Way said.

Hall of Science . . . As in the 1948 show, an outstanding feature of the 1953 exposition will be the Hall of Science.

Theme of the Hall of Science exhibits will be the story of petroleum's progress during the past 5 years—since the last exposition. Exhibits will be arranged in the order the activities take place in the operation of the oil industry, beginning with exploration, and moving through drilling, production, transportation, processing, and ending with marketing and distribution.

Seven subcommittees operating under a general scientific and technical committee headed by G. H. Westby, president of Seismograph Service Corp., are making arrangements for exhibits which will tell the story of oil's progress.

These exhibits will include a three-dimensional geologic time table and subsurface structure models in the exploration group; a complete scale-model drilling rig, together with a model LST tender for offshore operations; displays depicting water-flooding operations and gas injection, in the production division; an intricate model of an Orthoflow catalytic cracking unit; and, to show the importance of the growing petrochemical industry, this year's Hall of Science for the first time will contain an exhibit demonstrating how this new industry has increased the versatility of petroleum in providing better and cheaper products to the public.

The scientific exhibits also will include an electron microscope, a model product pipe-line system, well-logging equipment, and many other educational displays.

As in years past, the Hall of Science this year also will offer a series of outstanding oil-industry motion pictures.

I.R.A.A. Condemns Imports

CHICAGO.—Policies to be followed with respect to imports, prices, the residual fuel situation in the Midwest, and other problems of refiners were discussed here March 12 at a meeting of the directors of the Independent Refiners Association of America.

M. H. Robineau, president of the association, declared that the independent refiner is faced with a combination of factors which are threatening his market, and that the "continued increasing importation of residual fuel oil is creating a major problem."

Steps that may be taken, legislatively or otherwise, to cope with the situation were discussed as a prelude to the adoption of a definite program.

Industry Briefs

VANCOUVER, B. C.—Fargo Oils, Ltd., has completed arrangements for drilling 10 exploratory wells this year in the Peace River district of British Columbia. The company said all the wells will be drilled by other companies on 50-50 farmout arrangements. The first well, it announced, will be spudded by the end of the month in the Hudson Hope area west of Fort St. John gas field.

EDMONTON, Alta. — New World Oil, Ltd., Edmonton, has formed a new Delaware-chartered subsidiary, New World Oil, Inc., to carry on the parent firm's operations in the United States. The new company plans to begin drilling soon on three wildcats on its 20,000 acres of holdings in the Williston basin and on a 9,500-ft. test on a block in the Uintah basin of eastern Utah. The company also has leases and production in Wyoming and Kansas.

BATON ROUGE.—Bids to conduct exploration operations on the 85,000-acre Rockefeller wildlife refuge in Cameron and Vermilion parishes in Louisiana will be received by the Louisiana Mineral Board March 18. Rights will be auctioned to conduct geophysical operations until October 1, 1954. At the end of this term, the successful bidder will be given the opportunity to file for rights to drill on four separate blocks of 5,000 acres each.

EDMONTON, Alta.—The new $55,000,000 petrochemical plant now under construction here by Canadian Chemical Co., Ltd., will begin initial production in June, Robinson Ord, vice president and general manager of the company, said last week. The plant will process butane, propane, and recovered refinery gases to yield a variety of organic chemicals.

TAYLOR, Tex.—Delhi Oil Corp. has acquired 200,000 shares of Taylor Oil & Gas Co. common stock from former Taylor stockholders, according to G. L. Rowsey, chairman of the board. Purchase price was not disclosed. This is the second large block of stock in Taylor acquired by Delhi. Last July, the latter firm bought more than 388,000 shares of Taylor stock from Standard Oil Co. (N. J.) at $20 per share.

HOUSTON.—Houston Natural Gas Corp. has formed Houston Natural Gas Production Co. as a wholly owned producing subsidiary. Dr. Byron B. Boatright is vice president and general manager of the new company.

Reserves at New Peak

A.P.I., A.G.A. estimate proved liquid-hydrocarbon reserves at the start of 1953 stood at record 32,957,205,000 bbl.

NEW YORK. — Proved reserves of liquid hydrocarbons in the United States rose to a new all-time peak in 1952, but the net increase over the previous year was the smallest since 1947.

Special reserve committees of the American Petroleum Institute and the American Gas Association estimated proved reserves of total liquid hydrocarbons at the end of 1952 to be 32,957,205,000 bbl., topping by 764,572,000 bbl. the 1951 estimate. (Table 1).

Production of liquid hydrocarbons during 1952 was 2,541,554,000 bbl., 60,181,000 bbl. more than during 1951. When this all-time production high is added to the increase in year-end estimates of proved reserves it is indicated that during 1952, 3,306,126,000 bbl. of new supply was developed. This was 1,831,819,000 bbl. less than the increase of 5,137,945,000 bbl. in 1951.

The A.P.I.-A.G.A. report points out that the new supplies of liquid petroleum developed during 1952 were sufficient not only to compensate for every barrel withdrawn from the ground but also gave ¾ billion barrels left over for addition to the estimated proved reserves.

Crude oil . . . Despite record-breaking production, estimates of proved reserves of crude oil, the principal liquid hydrocarbon, rose from 27,468,031,000 bbl. at the end of 1951 to 27,960,554,000 bbl. at the end of 1952, a net increase of 492,523,000 bbl. (See Table 2). This increase, however, was the smallest since 1945. The net increase for 1951, the biggest to date, was 2,199,633,000 bbl.

Natural-gas liquids . . . Proved reserves of natural-gas liquids, the balance of the liquid hydrocarbons, were estimated at 4,996,651,000 bbl. at the end of 1952. This estimate was up 272,049,000 bbl. over 1951. The increase was the smallest since 1947. The net gain in 1951 was 456,939,000 bbl. Production of natural-gas liquids during 1952 was 284,789,000 bbl., an all-time high.

Natural gas . . . Gas production during 1952 was a record 8,639,638,000 M.c.f., and estimated proved reserves of dry natural gas increased 5,904,725,000 M.c.f. to 199,716,225,000 M.c.f. during 1952. (See Table 3). The increase, though 2,314,076,000 M.c.f. below the big increase in 1951, just about hits the average for the gains during the past 6 years.

What are reserves? . . . Proved reserves are both drilled and undrilled. The proved reserves, in any pool, include the liquid hydrocarbons or gas estimated to be recoverable by the production systems now in operation, whether with or without fluid injection, and from areas actually drilled up on the spacing pattern in vogue in that pool. The proved undrilled reserves, in any

TABLE 1—ESTIMATED PROVED RESERVES OF LIQUID HYDROCARBONS IN THE UNITED STATES
(Thousands of barrels of 42 U. S. gallons)

	Proved reserves as of 12-31-51	Extensions and revisions	New discoveries*	Production during 1952	Proved reserves as of 12-31-52	Changes in reserves during 1952
Alabama‡	7,860	460	8,400	1,085	15,635	7,775
Arkansas	387,508	42,020	2,431	28,827	403,132	15,624
California†	4,090,186	430,438	45,017	388,963	4,176,678	86,492
Colorado	377,088	2,454	8,435	30,947	317,030	—20,058
Illinois	670,907	29,427	3,811	64,438	639,707	—31,200
Indiana	50,816	14,602	2,194	11,908	55,704	4,888
Kansas	951,515	227,912	26,202	120,413	1,085,216	133,701
Kentucky	69,027	7,310	1,962	13,576	64,723	—4,304
Louisiana†	2,969,554	454,875	110,634	263,867	3,271,196	301,642
Michigan	65,122	4,843	1,479	13,450	57,994	—7,128
Mississippi	437,677	4,524	6,464	38,925	409,740	—27,937
Montana	111,769	30,272	27,150	9,871	159,310	47,551
Nebraska	18,504	2,300	6,313	2,565	24,552	6,048
New Mexico	742,259	188,352	24,252	69,962	884,901	142,642
New York‡	57,061			4,207	52,854	—4,207
North Dakota‡	4,983	43,200	29,440	1,420	76,203	71,220
Ohio	28,146	4,398	11	3,387	29,168	1,022
Oklahoma	1,787,582	237,002	33,312	215,370	1,842,526	54,944
Pennsylvania	97,565	38,073	107	11,381	124,364	26,799
Texas†	18,192,305	791,478	222,453	1,164,977	18,041,259	—151,046
Utah	29,744	13,000	1,420	1,708	42,456	12,712
West Virginia	62,683	1,758	220	7,921	56,740	—5,943
Wyoming	1,019,326	157,945	16,387	71,846	1,121,812	102,486
Miscellaneous§	3,456	1,387	2	540	4,305	849
Total U. S.	32,192,633	2,728,030	578,096	2,541,554	32,957,205	764,572

*Only a limited area is assigned to each new discovery, even though the committee may believe that eventually a much larger area will produce; for, in this report, the concern is only with actually proved reserves. †Includes offshore reserves. ‡Crude oil only. §Includes Alabama and North Dakota natural-gas liquids; Missouri, Tennessee and Virginia crude; and Florida crude and natural-gas liquids.

TABLE 2—ESTIMATED PROVED RESERVES OF CRUDE OIL IN THE UNITED STATES
(Thousands of barrels of 42 U. S. gallons)

	Proved reserves as of 12-31-51	Extensions and revisions	New discoveries*	Production during 1952	Proved reserves as of 12-31-52	Changes in reserves during 1952
Alabama	7,860	460	8,400	1,085	15,635	7,775
Arkansas	336,458	41,007	2,340	27,544	352,261	15,803
California*	3,760,870	409,209	43,542	359,450	3,854,171	93,301
Colorado	325,178	2,468	8,435	30,390	305,691	—19,487
Illinois	646,335	30,334	3,802	61,010	619,461	—26,874
Indiana	50,667	14,552	2,187	11,871	55,535	4,868
Kansas	791,946	213,246	25,942	114,145	916,989	125,043
Kentucky	58,549	6,999	1,806	11,789	55,565	—2,984
Louisiana*	2,284,781	406,553	92,643	226,447	2,557,530	272,749
Michigan	64,113	5,282	1,385	13,369	57,411	—6,702
Mississippi	385,387	3,526	4,408	34,512	358,809	—26,578
Montana	108,418	30,272	27,150	9,659	156,181	47,763
Nebraska	15,918	2,079	6,228	2,389	21,836	5,918
New Mexico	611,640	158,663	22,905	59,850	733,358	121,718
New York	57,061			4,207	52,854	—4,207
North Dakota	4,983	43,200	29,440	1,420	76,203	71,220
Ohio	26,436	4,304		3,350	27,390	954
Oklahoma	1,476,457	241,719	28,342	188,898	1,557,620	81,163
Pennsylvania	95,002	37,859		11,137	121,724	26,722
Texas*	15,314,964	440,795	170,016	1,009,607	14,916,168	—398,796
Utah	29,683	13,000	1,420	1,704	42,399	12,716
West Virginia	38,762	1,100		2,650	37,212	—1,550
Wyoming	973,440	144,997	16,037	69,752	1,064,722	91,282
Miscellaneous†	3,123	1,236		530	3,829	706
Total U. S.	27,468,031	2,252,860	496,428	2,256,765	27,960,554	492,523

*Includes offshore reserves. †Includes Florida, Missouri, Tennessee, and Virginia.

pool, include reserves under undrilled spacing units which are so close, and so related, to the drilled units that there is every reasonable probability that they will produce when drilled.

Estimates made by the A.P.I. committee do not include oil (liquid hydrocarbons) under the unproved portions of partly developed fields; oil in untested prospects; oil that may be present in unknown prospects in regions believed to be generally favorable; oil that may become available by fluid-injection methods from fields where such methods have not yet been applied; oil that may become available through chemical processing of natural gas; nor oil that can be made from oil shale, coal, or other substitute sources.

Caution . . . Estimates of provel reserves cannot be used in measuring the rate at which these reserves can be produced with or without physical waste. Oil or gas cannot be produced from permeable rocks in which they occur at any desired rate because the flow of oil through the pores of the oil-bearing rocks is controlled by the physical factors of the reservoir. Today's known reserves can be recovered only over a period of many years and at gradually declining annual rates. Only incorrect conclusions as to the life of reserves can be obtained by dividing them by the current rate of production.

The A.P.I. and A.G.A. committees make every effort to secure a fair, unprejudiced, and representative opinion. The subcommittees largely responsible for the data are comprised of geologists and petroleum engineers with long experience in reserve estimations.

Discoveries . . . New fields and new pools in old fields are seldom fully developed in the first year, and estimates of proved reserves necessarily represent but a part of the reserves which ultimately may be assigned to the new reservoirs each year. The total of new oil and gas added through discoveries estimated as proved in each year is comparatively small because development usually is not extensive during the first year. The total of new oil and gas reserves added through extensions, on the other hand, is comparatively large. As knowledge of the factors affecting production and reservoir performance becomes available, reserves in older fields can be estimated with greater precision and revised accordingly. The total quantity of new proved reserves for the year includes the oil and gas from discoveries and extensions, modified by revisions of previous estimates where new data have made better information available.

Canada's reserves . . . For the first time, the A.P.I. annual reserves report includes estimates of proved crude-oil reserves in the four western provinces of Canada.

Proved reserves of liquid petroleum in the provinces of Alberta, Manitoba, and Saskatchewan, and in the Northwest Territories, amounted to 1.7 billion barrels as of December 31, 1952. (Table 4).

These reports were prepared by the Committee on Crude-Oil Reserves of the Canadian Petroleum Association. The figures for Canada were arrived at by using the same definitions and procedures employed by the A.P.I. committee in compiling its estimates of crude-oil and natural-gas liquids reserves in the United States.

TABLE 3—ESTIMATED PROVED RECOVERABLE RESERVES OF NATURAL GAS IN THE UNITED STATES

(Millions of cubic feet—14.65 psi. at 60° F.)

	Changes in reserves during 1952					
	Reserves as of Dec. 31, 1951	Extensions and revisions†	New discoveries†	Net change in underground storage‡	Net prod.§	Total
Arkansas	931,314	91,070	3,020	630	41,452	984,582
California¶	9,482,445	269,427	65,938	—1,925	475,863	9,340,022
Colorado	1,138,451	31,851	42,181	0	48,234	1,164,249
Illinois	227,133	14,750	1,768	0	32,000	211,651
Indiana	30,807	9,990	1,472	1,790	7,345	36,714
Kansas	13,457,498	1,167,567	21,912	1,110	454,522	14,193,565
Kentucky	1,325,588	46,696	11,360	2,379	72,500	1,313,523
Louisiana¶	29,005,031	2,176,296	1,540,159	0	1,269,872	31,451,614
Michigan	203,025	3,296	18,612	40,498	10,888	254,543
Mississippi	2,439,969	21,771	118,224	417	216,321	2,364,060
Montana	828,107	12,885	17,236	2,051	32,676	827,603
Nebraska	95,810	1,264	3,964	0	7,080	93,958
New Mexico	11,589,979	2,669,335	217,160	4,458	442,043	14,038,889
New York	66,793	200	0	5,047	3,400	68,640
Ohio	689,135	32,607	8,275	33,966	32,500	731,483
Oklahoma	11,804,337	547,606	199,997	13,781	800,892	11,764,829
Pennsylvania	619,455	36,595	91,950	56,385	94,800	709,585
Texas¶	105,653,229	1,459,565	2,950,264	13	4,330,308	105,732,763
Utah	95,845	188,045	2,802	0	3,280	283,412
West Virginia	1,671,499	108,315	23,400	26,256	169,400	1,660,070
Wyoming	2,340,298	35,660	21,379	11,994	88,207	2,321,124
Miscellaneous*	115,752	9,679	49,970	0	6,055	169,346
Total	193,811,500	8,934,470	5,411,043	198,850	8,639,638	199,716,225

*Includes Alabama, Florida, Maryland, Missouri, North Dakota and Virginia. †Includes gas loss due to natural gas liquids recovery. ‡The net difference between gas stored in and gas withdrawn from underground storage reservoirs, inclusive of adjustments. §Net production equals gross withdrawals less gas injected into underground reservoirs. Changes in underground storage and gas loss due to natural gas liquids recovery are excluded. December production estimated occasionally. ¶Includes off-shore reserves.

TABLE 4—ESTIMATED PROVED RESERVES OF LIQUID HYDROCARBONS IN WESTERN CANADA

(In thousands of 35 Imperial gallon barrels which are equivalent to 42 U. S. gallon barrels)

	Proved reserves as of 12-31-51	Extensions and revisions	New discoveries*	Production during 1952	Proved reserves as of 12-31-52	Changes in reserves during 1952
Crude oil:						
Alberta	1,328,000	57,842	198,914	58,367	1,526,389	198,389
Manitoba	500		1,725	119	2,106	1,606
Saskatchewan	21,000	3,125	101,822	1,700	124,247	103,247
Northwest Territories	27,100	—19	.....	314	26,767	—333
Total crude oil	1,376,600	60,948	302,461	60,500	1,679,509	302,909
Natural-gas liquids*	11,348	39,675	14,970	619	65,374	54,026
Total liquid hydrocarbons in W. Canada	1,387,948	100,623	317,431	61,119	1,744,883	356,935

*All natural-gas liquids are located in Alberta.

Plant Nearly Finished

Illinois petrochem center to go on stream by July

TUSCOLA, Ill.—National Petro-Chemicals Corp.'s huge processing plant near here now is scheduled to begin operations before July.

Largest of its kind, the petrochemicals plant will process approximately 400,000,000 cu. ft. of gas daily taken

from the main transmission lines of Panhandle Eastern Pipe Line Co. and Trunkline Gas Co.

The plant will extract ethane from the gas, converting it to ethylene, which will form the basis for synthesizing ethyl alcohol and ethyl chloride. Annual output of the plant ultimately will be 130,000,000 gal. of L.P.G., 6,000,000 gal. of natural gasoline, 40,000,000 gal. of ethyl alcohol, 3,500,000 gal. of ether, and 6,500,000 gal. of ethyl chloride.

National Petro-Chemicals is owned 60 per cent by National Distillers Products Corp. and 40 per cent by Panhandle Eastern. Ground for the huge project was broken during the first week in December 1951.

Gas entering the processing center will go from the compressor station to an extraction plant, where liquid hydrocarbons will be removed and piped to a fractionation plant. Here they will be broken down by distillation into ethane, natural gasoline, and L.P.G.

The ethane then will be cracked and transformed into ethylene. Part of the ethylene will go to the alcohol plant, where it will be combined with water to make ethyl alcohol and ethyl ether. At the ethyl chloride plant, ethylene will be combined with hydrogen chloride to make ethyl chloride.

New Cathodic Method

Corrosion short-course speaker advocates installation of pipe-line anodes in two stages to increase protection

Paul Reed

TULSA.—Practices for the mitigation of corrosion are more significant for pipe lines than for other industrial facilities because 85 per cent of pipe-line investment is buried underground.

Pipe-line engineers, superintendents, and foremen met March 4 to 6 to discuss the latest coating and cathodic protection procedures at the Fourth Annual Tulsa Short Course for Pipeliners, sponsored by the Tulsa section of the National Association of Corrosion Engineers.

In applying cathodic protection for a reasonably well coated line, it was recommended that the installation of anodes be done in two stages. As the first step, half of the anodes would be installed, which were indicated by the preliminary estimate of current requirements. Such preliminary estimates would necessarily be for only the average current requirements per mile. After installing half of the indicated anodes in low-resistance areas, it was suggested that the installation be "allowed to cook" for several weeks or months before making a pipe-to-soil survey to determine the location of the remaining half of the anodes.

There is a tendency for the output of anodes to equalize as time goes on. Anodes which have been "loafers" will increase their current output.

In installation of anodes, there is often an erroneous impression given by the decline in current output shortly after anodes have been put in the ground. After the anode has had a chance to absorb water the current will be found to increase.

Leak records are vital in hot-spot protection and their importance should not be ignored, registrants were told. Conditions at the locations of the oldest leaks have frequently been aggravated by the installation of new pipe resulting in increased corrosion due to the difference in the metal conditions of two kinds of pipe.

In the cathodic protection of bare lines, the general practice is not to aim at complete effectiveness, which is expensive, but to reduce leaks to 5 to 10 per cent of leak occurrence before cathodic protection was applied.

Tank corrosion . . . Corrosion of the interior of tanks in sour crude service has been satisfactorily mitigated by application of coal tar on the bottom and 18 in. up on the side.

Measurement of current density at coated tank bottom has been facilitated by "pasting" a bare steel coupon by means of coating material so that it adheres to the tank bottom. This is convenient for test purposes.

Field demonstrations . . . At the field tests, a demonstration was given of the "harpoon" device for test lead installation with which cadwelding was done on pipe under water through a "post hole" instead of through the common large bell hole excavation. The harpoon has been developed by A. L. Stegner, Tennessee Gas Transmission Co., Houston.

Lancy F. Heverly, Great Lakes Pipe Line Co., Kansas City, Mo., demonstrated a method for the location of coating defects in coated pipe line using a Wahlquist pipe locator and the Pearson technique. He also located leaks in pipe using a combination of a coating fault detector and a leak detector attachment for use with this pipe locator.

T. L. Canfield, Consolidated Gas Utilities Corp., Oklahoma City, demonstrated tests for pipe-to-soil potential in reference to anodic and cathodic areas.

Other instructors and speakers were: Karl Feldman, Sinclair Pipe Line Co.; F. M. Cloninger, Texas Pipe Line Co.; Yale W. Titterington, Pipe Line Anode Corp.; Frantz M. Hieronymus, Barrett Division, Allied Chemical & Dye Corp.; T. M. Ragland, Phillips Petroleum Co.; Marshall E. Parker, Cormit Engineering Co.

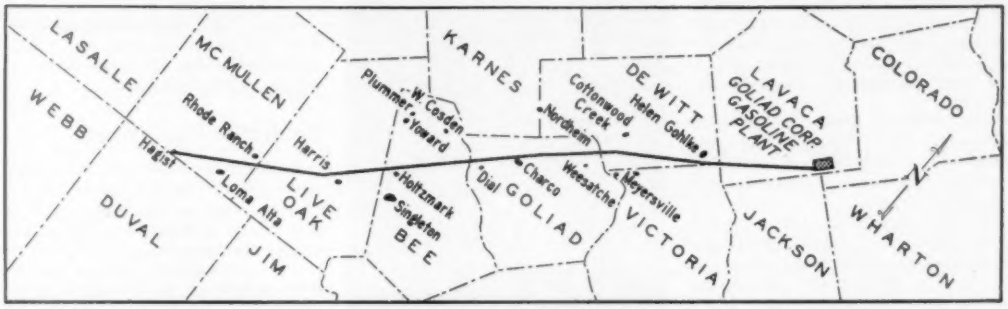
W. A. Hutchison, Sinclair Pipe Line Co., was chairman of the Planning Committee, which included Hugh A. Brady, Pipe Line Anode Corp.; T. D. Williamson, Jr., T. D. Williamson, Inc.; Jim Bell, Service Pipe Line Co.; Ed Bartolina, Moorlane Co., and Mel Maddox, Pittsburgh Coke & Chemical Co. Jack P. Barrett is chairman of Tulsa section of N.A.C.E.

DEMONSTRATING HOW TO INSTALL current-limiting resistors to control output of magnesium anodes at field demonstration on Sinclair Pipe Line Co. system during N.A.C.E. Short Course is Marshall E. Parker (lower right), of Cormit Engineering Co. T. M. Ragland, Phillips Petroleum Co., Bartlesville, Okla., a short-course instructor, is at lower left.

New Company Organized

WICHITA, Kans.—Vickers Explorations, Ltd., has been formed as a drilling and production company to operate in Texas, New Mexico, Oklahoma, and Kansas, Jack A. Vickers, Jr., president of Vickers Petroleum Co., Inc., announced last week.

The new company spudded in its first well March 11 on a 500-acre block in Garvin County, Oklahoma, 6 miles west of Antioch field.



WILCOX TREND main line extends from Hagist field to Provident City where it will connect with Texas Eastern.

System Nearly Finished

Nation's biggest wet-gas gathering system, along South Texas' Wilcox trend, to begin operation on first of May

Joseph A. Kornfeld

DALLAS.—The nation's longest wet-gas gathering system, now under construction in the Wilcox trend in South Texas, will be placed in operation May 1, according to Harry W. Bass, president of Wilcox Trend Gathering System, Inc.

The $10,000,000 project comprises 157 miles of 14 and 16-in. transmission lines, laterals, and a 2,200-hp. compressor station. A separate company, Goliad Corp., plans to construct a natural-gasoline plant with a capacity of 134,000,000 cu. ft. of natural gas a day at Provident City, at the eastern terminal of the line.

HARRY W. BASS

The first segment, 80 miles of 16-in. pipe, already has been laid from Provident City to Goliad County by H. B. Zachry, San Antonio contractor. Construction work began only 3 days after the Federal Power Commission granted a certificate of convenience and necessity to Wilcox Trend on December 12 *(The Oil and Gas Journal, December 29, 1952, page 112)*.

Texas Eastern Transmission Co., which will receive the dry gas after processing, expects to complete before May 1 a 315-mile, 24-in. transmission line from its system near Castor, La., to Provident City. The line, which will have an initial capacity of 140,000,000 cu. ft. per day, will cost $23,283,540.

Goliad's natural-gasoline plant at Provident City will not be completed before June 1954, but dehydration facilities capable of processing 134,000,000 cu. ft. of gas per day will be ready for operation by May 1.

Background . . . Wilcox Trend's president is founder of Harry Bass Drilling Co. and Can-Texas Drilling Co. and is secretary-treasurer of Trinity Gas Corp.

The Wilcox Trend program had its origin in 1951 when Bass began a study of the group of natural-gas and distillate fields lying along the 200-mile trend. While none of the fields had reserves justifying construction of a plant, Bass concluded there were sufficient reserves along 160 miles of the South Texas portion of the trend to justify gathering the gas to a central point and processing it.

A detailed engineering report showed estimated reserves in excess of 700 billion cubic feet and 60 shut-in gas wells completed in Wilcox reservoirs lying between 7,000 and 10,000 ft. located in Duval, McMullen, Live Oak, Bee, Goliad, Karnes, Victoria, and De Witt counties. Most of the wells ranged from 8 to 20 million cubic feet per day in open-flow potential, but some were rated above 100 million.

Contracts . . . Since the report was prepared, Wilcox Trend has entered into more than 30 gas-purchase contracts involving about 100,000,000 cu. ft. daily. One contract calls for delivery of 10,000,000 cu. ft. daily of stripped oil-well gas from Helen Gohlke field of Goliad County, taken from a field gathering system operated by Shell Oil Co. Another covers 10,000,000 cu. ft. of cycled gas from Nordheim field of De Witt County.

The other 80,000,000 cu. ft. will be wet gas picked up principally from a group of about 60 gas-distillate wells. The combined gas stream involving wet, cycled, and stripped oil-well gas, is a fairly lean mixture containing about 0.9 gal. per M.c.f. of propanes plus.

Separate contracts have been entered into by Goliad Corp. and Wilcox Trend with the producers. These provide that Wilcox will purchase the dry components of the gas and Goliad will buy the liquefiable hydrocarbons, giving producers two sources of revenue from their gas. All but two producers agreeing to sell gas to Wilcox have signed with Goliad.

Wilcox and Goliad also have signed a contract under which Wilcox will gather the gas and deliver it to Goliad's plant at Provident City. Goliad will remove the liquid hydrocarbons and deliver the dry gas for Wilcox to Texas Eastern.

In return for the gas-transportation service, Goliad will dehydrate the gas. Until the extraction plant is completed, Wilcox will pay Goliad ¼ cent per M.c.f. for the dehydration service.

Initially Wilcox will pay 10 cents an M.c.f., the maximum Office of Price Stabilization price. Contracts, however, provide for a yearly increase of 2 mills in price. They also provide for redetermination of the price at the end of each 5-year period of operations.

The system . . . The main line of the gathering system originates in Hagist field of Duval County and extends northeastward to Provident City in Lavaca County. Initial operating pressure for the first 10 years will be 1,200 psia., dropping to 600 psia. during the second 10 years.

Airfield Over Oil Field Poses Problem

SWEETWATER, Tex.—Oil operators drilling in Rowan & Hope pool near here not only have to account to the usual state regulating agencies but to the Civil Aeronautics Administration as well.

The field, which now has 20 wells producing from Pennsylvanian reef limestone at 6,500 ft., has been drilled right up to the runways of Sweetwater's municipal airport.

To take care of air safety, an airport zoning commission operates to regulate construction in the vicinity of the airport. Drilling near the airfield is regulated both by the zoning board and the C.A.A. Rigs must be painted white and International orange and fitted with special lighting equipment. Christmas trees of wells located within the airport proper are underground with flush concrete tops.

Rowan & Hope, Inc., currently is completing two wells, Seaboard Oil Co. of Delaware has a rig running, and Sun Oil Co. is drilling two extension tests northwest of the field. Other locations have been permitted, but after a conference of C.A.A. officials with oil operators, it was indicated that some of the proposed locations could not be drilled for several years in the interest of flying safety.

PROXIMITY of drilling operations to airport runways is illustrated in this predawn shot of the derrick of Rowan & Hope's 3-A City of Sweetwater, snapped from a plane which had just taken off (note wing at lower right).

ROCKY MOUNTAIN

New Plant Planned

Signal to process wet gas from Tioga, Beaver Lodge

WILLISTON, N. D.—Signal Oil & Gas Co. will build a 40,000,000-cu. ft. natural-gasoline and sulfur-extraction plant to process wet gas from Beaver Lodge and Tioga oil fields.

Signal last week was reported making arrangements for purchasing a site near Tioga, about midway between the centers of the producing areas.

The plant, originally planned by Amerada Petroleum Corp. *(The Oil and Gas Journal, September 15, 1952, page 150)*, will be built and operated by Signal under an agreement with Amerada. This provides that Amerada will retain title to the gas gathered and processed by Signal. The liquid products and sulfur extracted from the gas will be marketed by Signal and the dry gas will be returned to Amerada for sale. Amerada also will share in the proceeds from the sale of products from the plant.

Operating plans . . . Under the agreement, Signal will lay about 200 miles of gathering lines ranging from 4 in. to 30 in. in diameter. Center of the system will be a 20-mile, 30-in. line running from the northern part of Tioga field to the southern portion of Beaver Lodge.

E. H. McCollough, Amerada vice president, said it is estimated that the plant, gathering system, and marketing facilities will require an outlay within the next 2 years of $10,000,000 and an ultimate investment of $15,000,000. Output of the plant, at capacity of 40,000,000 cu. ft. of wet gas daily, is expected to be 150,000 gal. of natural gasoline and L.P.G. and about 40 tons of sulfur.

Construction is scheduled to begin within the next 2 or 3 months, McCollough said, with the plant going into operation no later than autumn of 1954. Gas now produced with the oil in the two fields is being flared at the rate of about 14,000,000 cu. ft. per day.

Crude-oil production in the area is about 10,000 to 12,000 bbl. per day, depending upon tank-car availability. Gas-oil ratio is about 1,200:1. McCollough said it is expected that a pipe-line outlet for the fields will be available by the time the gasoline plant is finished, permitting crude-oil production to be increased to such a point that available gas will total about 40,000,000 cu. ft. per day.

Amerada owns about 85 per cent of the current production in the area. It is expected, McCollough said, that the Signal plant also will process gas of other producers in the area.

Signal, the largest independent producer of natural gasoline and L.P.G. on the West Coast, has no production at present in North Dakota.

Production Tax Passed

BISMARCK, N. D.—A bill providing a gross-production tax of 4¼ per cent on crude oil has been passed by both houses of the state legislature and sent to the governor.

Two other bills affecting the petroleum industry in the nation's newest oil state also have been passed and sent to the governor. One provides a depletion allowance of 27½ per cent in calculating state income taxes. The other requires bonding of oil and gas brokers to the extent of $3,000.

The 4¼ per cent gross-production tax represented a victory for the state's young petroleum industry. The North Dakota house of representatives earlier had passed a bill levying a tax of 5¾ per cent. The lower tax cleared the senate by only a 1-vote margin.

The gross-production tax, even at the lower figure, did not have the uniform backing of the petroleum industry. One group had fought consistently for an ad valorem tax rather than a gross-production tax.

The North Dakota Oil and Gas Association took the position that the industry in general did not approve the gross-production tax theory and used its efforts to try to convince the legislature that the rate of 4¼ per cent as passed was too high a rate since the state is only in the beginning of an exploration program and the price of oil to the producer is far below posted field prices in areas where the industry is fully developed and integrated.

Compact Bill Vetoed

CHEYENNE.—Gov. C. J. Rogers of Wyoming has vetoed a measure passed by the 1953 legislature, now adjourned, which opened the way for Wyoming to become the twenty-first state to affiliate with the Interstate Oil Compact Commission.

Rogers expressed a fear that Compact membership might "confuse the present orderly production of minerals and may even possibly end by having imposed . . . undue restrictions which we may have cause to regret." Among major oil producing states, only Wyoming and California are not Compact members. Similar legislation enabling North Dakota to join the Compact Commission was passed by the 1953 legislature and has been approved.

Sulfur Surplus

Oil industry will produce much more than it needs

WASHINGTON. — The oil industry this year will produce over 100,000 tons more of sulfur than it consumes in refinery operations.

The surplus over requirements is expected to exceed 200,000 tons in 1954, a 10-fold increase compared with the excess of 20,000 tons produced in 1952, it was reported last week by the Petroleum Administration for Defense.

In view of the fact that the oil industry is itself one of the largest industrial consumers of sulfur and as recently as 1951 was 27,000 tons short of meeting its own requirements, the record of expansion of production is impressive, PAD officials said.

Sulfuric acid requirements for refining in 1951 represented gross sulfur needs of 585,000 tons, but net requirements were only 235,000 tons because of the recovery of sulfur from spent acids and acid sludges, PAD explained.

Expansion rundown . . . Since the sulfur expansion program was initiated in 1950 the industry has completed 12 projects for recovery of sulfur from natural gas or refinery gases, 13 projects are nearing completion, and at least 3 more are planned for future construction. Certificates for accelerated tax amortization of from 70 to 85 per cent of the estimated cost have been approved for each of these projects.

The industry produced 230,000 tons of sulfur in 1951, 3,000 tons of it from new plants. Last year, the production was 290,000 tons, of which 60,000 tons was from new plants. This year, new plants will contribute 100,000 tons and in 1954 another 110,000 tons to bring total output to 500,000 tons a year.

New Materials Plan Due

WASHINGTON.—The Controlled Materials Plan under which the oil and other industries receive specific allotments of steel, copper, and aluminum will be replaced July 1 with a "defense materials system" now being worked out by the Office of Defense Mobilization.

With the termination of controls June 30, industry will be free to buy when, where, and what it desires in the way of metals other than nickel-bearing stainless steel, but specific allotments will be made for production and construction for defense.

The regulations to provide for an orderly transition from the total control system to one of support for defense programs already have been drafted, but their application will depend upon continuance by Congress of the Defense Production Act authority to regulate the distribution of materials.

WATCHING WASHINGTON

Bertram F. Linz

Land Policy to Change

Changes in federal policy with respect to the natural resources of the public lands are in the offing.

What modifications of policy will be made, however, will depend on the result of studies to be made in the Interior Department and will be discussed with oil and gas operators and other interested groups before being ordered, it has been indicated by Interior Secretary Douglas McKay.

McKay indicated that in the past 2 months there has been increased pressure on the department in behalf of claimants for public land rights not always in the best interests of the country. But that, he said, is to be expected with every change in administration, which offers an opportunity for the advancement of claims by those who would exploit the public resources for their own gain and the public loss. The department, he intimated, will be no more receptive to such claims than in the past.

At the same time, McKay pointed out, the advent of a new administration offers an opportunity to review existing policies for management of the public resources to determine whether they may be improved.

Any changes made in these policies as a result of department studies will be in the direction of tightening the regulations to eliminate speculation and other practices which retard proper development of the natural resources of the public lands, he indicated.

Question of Law

Attorney General Herbert Brownell's suggestion that Congress simply give the coastal states authority to administer and develop the undersea natural resources has raised a knotty question for the committees in charge of tidelands legislation.

Brownell's recommendation was made to avoid tying the tidelands up in court litigation, which opponents of state ownership have threatened if Congress passes a quitclaim bill *(The Oil and Gas Journal, March 9, page 75)*.

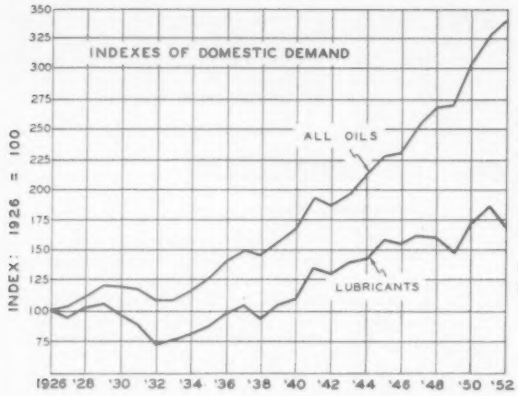
Actually a much broader issue is involved. There is a question whether, under international law, any claim to "ownership" beyond the traditional 3-mile limit would be recognized. Ownership denotes a right to keep trespassers off, but under international law the open sea is free to all and the 3-mile belt is the area "controlled" by a coastal nation.

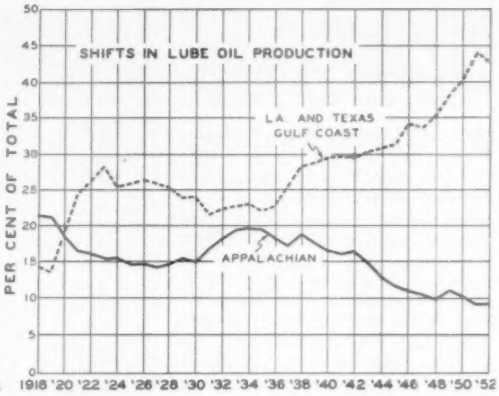
In recent years many countries have extended their claims of control far beyond the 3-mile limit. The United States claims control 12 miles out for customs purposes and to the edge of the Continental Shelf for natural resources. Other countries claim varying distances for regulation of fishing, etc. And only a sovereign nation can exercise this control—not a state.

The seaward limits set by a country are valid only to the extent they are accepted by other nations and while they are usually recognized for the regulation of fishing, customs, etc., it might be another matter should any claim of ownership be made. In the case of our tidelands, such a claim might be contested by Mexico, which recently seized a number of United States fishing boats for violating her offshore restrictions.

Apparently, it is Brownell's idea to avoid both domestic and international conflicts by skirting the issue of ownership while restoring to the states their former rights to exploit the natural resources of the marginal sea.

Meanwhile, supporters of federal control are dickering for the votes of delegations from the inland states by offering to recognize formally their ownership of the navigable waters within their borders.




SHIFTS IN LUBE OIL PRODUCTION
PER CENT OF TOTAL
LA. AND TEXAS GULF COAST
APPALACHIAN
1918 '20 '22 '24 '26 '28 '30 '32 '34 '36 '38 '40 '42 '44 '46 '48 '50 '52

Lube Picture Dark

Capacity is gaining over demand and foreign plants are cutting export market; outlook is for strong competition

John C. Casper

OFFICIALS of the Petroleum Administration for Defense have decided to continue the announced program of encouraging expansion of lubricating-oil facilities over the next 3 years.

The plan calls for total lube-producing capacity of 194,000 bbl. daily by the end of 1955. Capacity at the beginning of 1952 was reported at 178,000 bbl. daily compared with 161,000 bbl. daily at the start of 1951 and 149,300 bbl. daily on January 1, 1950.

Lube capacity at the end of this year has been forecast at 182,000 bbl. daily by PAD. Also, PAD has estimated that total demand for lubricants over the next 3 years will average about 153,000 bbl. daily.

At this rate, capacity at the end of 1953 will be almost 19 per cent greater than average production required to meet demand over the next 3 years.

Final demand data for 1952, released by the Bureau of Mines, indicates that domestic demand for lube oils last year represented the smallest percentage of total domestic demand since refining records were started in 1918.

Also, 1952 was the first year in the past 25 with a significant decrease in lube-oil demand in a year when a gain was reported in the demand for all oils.

Demand climbing slowly . . . The trend in demand for lubricants has been upward over the past 25 years, but the growth has been at a lower relative rate than the gains in demand for all products combined. In the accompanying table, domestic demands for lubricants since 1926 are compared with domestic demands for all oils over the same period.

When this comparison is expressed as a ratio, it shows the smaller relative gain for lube oils. Lubricant demand in 1926 represented 2.89 per cent of demand for all products, but the ratio gradually declined until it has been below 2.0 per cent in all years since the end of the war. The low point was reached in 1952 with 1.43 per cent.

COMPARISON OF LUBE-OIL DEMAND WITH DEMAND FOR ALL PRODUCTS

Year—	Domestic demand (thou. bbl. daily)		Ratio, lubes to total (%)
	Lube oils	All products	
1926	61.8	2,140	2.89
1927	59.3	2,198	2.70
1928	63.3	2,357	2.69
1929	64.7	2,576	2.51
1930	59.2	2,538	2.33
1931	54.6	2,474	2.21
1932	45.4	2,283	1.99
1933	47.0	2,379	1.97
1934	50.6	2,521	2.01
1935	53.9	2,695	2.00
1936	61.0	2,986	2.04
1937	63.9	3,205	1.99
1938	58.2	3,115	1.87
1939	65.0	3,373	1.93
1940	67.5	3,625	1.86
1941	82.9	4,071	2.04
1942	79.6	3,972	2.00
1943	86.2	4,168	2.07
1944	88.4	4,566	1.94
1945	96.8	4,857	1.99
1946	95.6	4,912	1.95
1947	98.3	5,452	1.80
1948	98.3	5,775	1.70
1949	90.7	5,803	1.56
1950	106.4	6,507	1.64
1951	115.9	7,041	1.65
1952	104.2	7,281	1.43

Part of this slower relative growth in demand for lubricants has been due to unusual growth in use of some of the other petroleum products. The rapid rise in use of distillate oil for space heating increased the over-all demand for products without influencing the use of lubricants. Increases in demand for gasoline, diesel fuels, and heavy fuel for power have been accompanied by gains in demand for lubricants, but the relative increases for these fuels have been smaller than the gains in use of distillate for home heating.

In the period from 1936 through 1951, sales of distillates for space heating increased 257 per cent. Consumption of gasoline and diesel fuel combined gained 144 per cent in the same period. Domestic demand for residual fuels increased only 75 per cent.

The comparison of relative gains by lube oils and all products is shown by the lines on the first chart. The data are expressed as indexes to show these comparisons. The line representing growth in demand for all oils has a much steeper slope than the line for lubricants.

The outlook for lube-oil demand over the next 3 years, as estimated by PAD, shows very little increase over 1952. The forecast average for the 3-year period is actually less than total demand for 1951. Increases in domestic demand are to be balanced by expected decreases in exports as new lube-producing facilities are completed abroad.

Foreign output rising . . . Free World production of lubricants outside the

United States averaged 19,100 bbl. daily in 1946. At that time, production in western Europe and Japan was very low because of refinery destruction during the war. Foreign Free World production climbed to 29,500 bbl. daily in 1949 and to 45,600 bbl. daily in 1951. Data for the full year 1952 are not available.

Some lube capacity has been added in western Europe since the record production of 1951 and still other units will be added over the next 3 years.

Imperial Oil, Ltd., announced plans for a lube plant at its refinery at Edmonton, Alta. This plant, scheduled for completion about mid-1955, will have a capacity of about 2,000 bbl. daily.

In the period from 1926 through 1952, exports of lube oils were about 40 per cent of consumption in this country. The rapid expansion in lube capacity abroad indicates that the recent decreases in export demand were not temporary dips in foreign buying but were indicators of still smaller exports in the future.

Marketing tough . . . The decrease in total demand for lubricants in 1952 was accompanied by very soft markets, and most of the important lube manufacturers have predicted that lube markets will be very competitive all of this year and possibly next year.

Price decreases in the last half of 1952 reduced realization from lube plants at most refineries. In the Mid-Continent area solvent bright stock prices were off about 25 per cent between October 1952 and February 1953. Postings for solvent neutrals were down almost 30 per cent over the same period.

Producers of Pennsylvania Grade crude had petitioned the Office of Price Stabilization in 1952 for an increase in ceiling prices of this crude of 72 cents a barrel. However, by the time ceilings were removed in February of this year the lube market was so soft that the price increase for Pennsylvania Grade crude was held to 15 cents a barrel.

Refinery stocks of Pennsylvania Grade lubricating oils at the end of January had gained slightly more than 100 per cent over the corresponding date in 1952. The increase for the month of January was 14.5 per cent.

Lube center shifting . . . Variations in demand for lubricants have been accompanied by shifts in production within this country. When refining statistics were first collected in 1918, the East Coast district produced 30.6 per cent of all lubricants and the Appalachian district accounted for 21.7 per cent.

In recent years there has been a sharp drop in the percentage position of the Appalachian district and a rapid rise in production at refineries on the Gulf Coast. Refiners in the Gulf Coast districts of Texas and Louisiana produced 42.3 per cent of lubes in 1952. The East Coast district was down to 19.4 per cent of the total, and refiners in the Appalachian district produced only 8.9 per cent.

With prices reduced for almost all grades of lubricants and with an outlook for very competitive markets, probably for several years, some of the projected lube capacity may replace older units in areas where the production of certain grades of lubricants will not be profitable.

WEST COAST

Elk Hills Plan Approved

Armed Services Committee endorses additional drilling, hike in production; Buena Vista water flood proposed

WASHINGTON.—Navy Department plans to protect the Elk Hills Naval Oil Reserve against seepage losses by drilling more wells and increasing production have been approved by the House Armed Services Committee.

But the committee was told that the primary purpose in setting up the four oil reserves—of assuring the Navy of that day a 25 years' supply of oil—has not been achieved and all the Government has today is one reserve which could produce perhaps 150,000 bbl. daily in the event of war.

The department's program was outlined by Navy Secretary Robert B. Anderson, who said he was in full accord with the intent of Congress to retain the Government's oil in the ground.

It was Capt. Robert H. Meade, director of naval petroleum reserves, who expressed doubt that the Government's program was providing the insurance originally contemplated.

Meade told the committee he agrees with the principle of leaving the oil in the ground as a safeguard against an emergency. He pointed out, however, that the Navy's reserves are negligible in comparison with wartime military demand and "we must depend on the oil industry to supply the greater part of our supply in time of war."

Drilling plans . . . Anderson told the committee that he has discussed the possibility of injecting salt water on the south side of the reserve to stabilize the pressure, but engineers say the field is not susceptible to that treatment because of diverse permeability and the possibility water would only increase the entrapment of oil.

As worked out now, the department plans to put one rig to work, drilling two wells a month. The wells would be drilled in each of the fault areas consecutively so that the department would

Offshore Drilling Poses Problems

One of the host of problems encountered by oil companies engaged in offshore drilling is that of supply, and one of the biggest supply headaches is getting enough fresh water. Here two members of a drilling crew on a marine rig operated by Shell Oil Co. struggle to make a fresh-water barge (foreground) fast to the big drilling unit in choppy, open water.

have a constant evaluation of how much good the new wells are doing.

By this method it might not be found necessary to drill the full number of 36 wells originally proposed or to increase production by as much as the 18,000 bbl. daily that was contemplated, he said. At the same time, this plan would serve to keep down the cost of the project, originally estimated at $1,500,000. The Budget Bureau already has approved $500,000 for a start, Anderson said.

Buena Vista flood . . . The committee also was told that General American Oil Co. of Texas, holder of leases on certain lands in the Buena Vista reserve, and D. D. Feldman Oil & Gas, an oil-field engineering firm, have proposed a water-flood project to increase production.

Under the plan, coring operations would be undertaken to obtain information as to the feasibility of the project. If satisfactory results were obtained a pilot project would be started on a selected 100-acre tract, and finally, if the pilot results warranted, a full-scale project would be carried out.

To do this, however, the lessee has asked that instead of the present sliding scale of royalties the department agree on a flat rate of 14 per cent, contending that otherwise the company could not stand the cost of the project. If carried through to successful conclusion, it was estimated, the project might result in the receipt of additional royalties by the Navy between 488,000 and 1,350,000 bbl. of oil.

Anderson told the committee he has had no opportunity to make a detailed study of the project and had not decided whether the proposed rate of 14 per cent was the proper royalty. However, he indicated, he favored the recovery plan as a whole.

Anderson and Navy officials appeared before the committee under a plan of "consultation" of many years standing. The committee does not pass on projects in the naval reserves formally but signifies its approval or disapproval of the department's plans as they are developed. The department, however, is not legally bound to conform to the committee's views, but if it didn't it might find difficulty in getting funds from the Appropriations Committee.

California Output Rises

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Field contributing most to the gain was Elk Hills, up 2,000 bbl. to 9,580 bbl. daily. Only other substantial increase was at Midway-Sunset, up 1,550 to 33,140 bbl. daily.

Smog Controls Drafted

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Opposing forces heard on Oklahoma pipe-line bill

OKLAHOMA CITY. — Independent refiners and small producers were battling spiritedly during a hearing last week before the oil and gas committee of the Oklahoma House of Representatives over a bill which would force pipeline firms to lay lines to any oil field and require crude purchasers to buy any oil which the Oklahoma Corporation Commission should deem within economical reach of their facilities.

The bill, sponsored by Rep. Glenn Co'lins, of Konawa, would give the commission authority to set up purchasing areas and designate which crude buyers should operate in each area.

Opposing views on the value of the bill were presented the committee by W. A. Delaney, Jr., independent producer of Ada, and by R. G. Bandy, manager of crude-oil purchasing for Midland Cooperative Wholesale Co., which operates a refinery at Cushing.

The producers' side . . . Delaney told the committee that there is a profound need for the bill. While other conservation acts are a help to major producers and pipe lines, he said, the measure now under consideration would be one of the few acts ever to be proposed to help the "shirt-tail operator." An assured pipe-line connection, he said, will keep many of the stripper fields in production until they are exhausted, while without low-cost transportation and a fair price these fields would have to be abandoned.

The purchasers' side . . . Bandy, on the other hand, said if his firm is forced "to buy crude where it's uneconomical or whether I need it or not, I'll be forced to go out of business." L. B. Simmons, retired official of Deep Rock Refining Co., said the small refiner operates on such a small margin of profit that he couldn't absorb the hauling costs which would follow passage of the bill. Likewise, he said, pipe lines and gathering units should not be forced to build lines into areas where the production is too small to amortize the lines.

More than 100 oil men attended the hearing.

A.P.I. Production Meet Near

TULSA.—The Mid-Continent district spring meeting of the American Petroleum Institute Division of Production will be held at the Mayo Hotel here March 18-20.

Meetings of special committees will be conducted the opening day of the conference. Technical papers to be presented March 19-20 include:

Thursday, March 19 . . . "Factors Affecting the Angle of Inclination of Rotary Bore Holes," Arthur Lubinski, Stanolind Oil & Gas Co., Tulsa, and Henry B. Woods, Hughes Tool Co., Houston; "The Effects of Use of Oil in Drilling Fluids," J. L. Lummus, Stanolind Oil & Gas Co., Tulsa, H. M. Barrett, Phillips Petroleum Co., Oklahoma City, and Harry Allen, Carter Oil Co., Tulsa; "Removal of Flow Restrictions in Well Completions," Charles Clason and Wayne F. Hower, Halliburton Oil Well Cementing Co., Duncan, Okla.

Friday, March 20 . . . "Equipment Trends in Shaped Charge Perforating," Maynard L. Russell and G. L. Gore, Dowell Incorporated, Tulsa; "Are You a Supervisor?" R. B. Sale, Continental Oil Co., Ponca City, Okla.; "Cathodic Protection of Steel Vessels Exposed to Oil Fields Brines," Cecil O. Smith, Carter Oil Co., Tulsa; "Application of Hydraulic Fracturing to the Stimulation of Oil and Gas Production," Roscoe C. Clark, Continental Oil Co., Ponca City; "Water Flooding—Fankhauser Unit, Greenwood County, Kansas," J. D. Walters, Sunray Oil Corp., Tulsa; "High Pressure Gas Injection-Mechanism of Recovery Increase," R. L. Slobod and H. A. Koch, Jr., Atlantic Refining Co., Dallas; "Artificial Brain is Required for the Solution of Sucker Rod Problem," M. H. Halderson, Phillips Petroleum Co., Bartlesville, Okla.

Navy to Quit Alaska

Nine-year oil hunt to end after unsuccessful expenditure of $45,000,000; plans for insulated crude line revealed

Bertram F. Linz

WASHINGTON.—The Navy Department is abandoning its quest for oil in Alaska after having expended approximately $45,000,000 since 1944 on an exploration program which has resulted in no commercial discoveries.

The decision to pull out was disclosed by Secretary Robert B. Anderson in an open-hearing "consultation" with the House Armed Services Committee at which he heard Rep. Leon H. Gavin of Pennsylvania compare the Alaskan program with the wartime "Canol" project which cost the country $138,000,000 and was abandoned 10 days after it was elaborately dedicated.

As the committee opened its discussion of activities in Naval Petroleum Reserve No. 4, Chairman Dewey Short of Missouri said it was the "overwhelming opinion" of the committee that the project should be terminated.

In a report to the committee, Gavin said a total of $52,765,000 has so far been appropriated by Congress for the work and that the former democratic administration proposed to continue the program through 1955 and close it out in 1956 at the cost of another $25,000,000. That sum, plus some $7,000,000 of unexpended funds and some recovery from more than $6,000,000 of material on hand, will be saved by Anderson's decision.

Transportation problem . . . Gavin pointed out that Point Barrow is closed in 10 or 11 months of the year and that even if oil was found in commercial quantities the problems of transporting it out would be "staggering." A pipe line just to get the oil as far as Fairbanks, 500 miles away, would cost $150,000,000, and in the long run it was the Navy's intention to get out once oil was found and leave development to private enterprise.

"Let private enterprise carry on their own exploration," Gavin suggested.

"I am in substantial agreement, at least, with Mr. Gavin," Anderson told the committee. "I would like to suggest that all operations be suspended as of now and no appropriation be asked for in 1954."

Anderson explained no drilling operations are going on in the reserve at the present time and it would be simply a matter of withdrawing material and people.

Pipe-line study . . . Although no oil was discovered in the reserve, the Navy was experimenting with pipe-line construction which would be needed to move it if found, it developed during the discussion.

This experimentation centered around the use of tundra above and below pipe laid 3 or 4 ft. underground, but it was found that tundra would be available along only a short part of the distance the line would have to go and some other form of insulation would be required.

Orderly closeout . . . In Fairbanks, Alaska, J. R. Coleman, project manager for Arctic Contractors, Inc., which has been doing the work for the Navy, said present plans call for an orderly end to operations.

Some equipment will be returned to the United States by ship during August. Most personnel connected with drilling operations, he said, "will be terminated in the very near future" while some in the financial end or connected with various construction activities would remain longer.

Development Terms Revealed

BARTLESVILLE, Okla. — Phillips Petroleum Co. and Kerr-McGee Oil Industries, Inc., have negotiated a general agreement providing for the exploration and development of the Katalla-Yakataga area of Alaska.

Under the agreement, Phillips will operate the properties, and Kerr-McGee will do the drilling and take a one-half interest in the venture. When the agreement sharing interest in the project is written and executed, it will be submitted to the Department of Interior for its approval.

Phillips said it became interested in the area early in 1952 and subsequently executed operating agreements with 416 individuals who had filed lease applications in the area and with 13 individuals holding leases.

The Interior Department on February 6 approved the issuance of a block of more than 500 leases covering near 1,000,000 acres in the area *(The Oil and Gas Journal, February 16, page 94)*. Phillips, under terms of the contract, was required to drill 12 tests over a period of 10 years, 6 in each of two districts, and to spend a minimum of $1,200,000 for exploration by June 30, 1956, and thereafter an annual minimum sum equal to 40 cents per acre.

Preliminaries Are Expensive

The cost of drilling a well often is small compared to the expense incurred before the rig actually begins to make hole. Here is a typical portion of an 80-mile road which Cities Service Oil Co. had to hack out of the Canadian wilderness to reach a location at Lubicon Lake in northern Alberta. Just cutting trees and bulldozing a strip through forest, swamp, or mountains isn't enough on projects like this. The roads have to be engineered carefully to stand up under the heavy loads of equipment and supplies carried over them to the drill sites. (Cities Service photo).

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Opposing views on the value of the bill were presented the committee by W. A. Delaney, Jr., independent producer of Ada, and by R. G. Bandy, manager of crude-oil purchasing for Midland Cooperative Wholesale Co., which operates a refinery at Cushing.

The producers' side . . . Delaney told the committee that there is a profound need for the bill. While other conservation acts are a help to major producers and pipe lines, he said, the measure now under consideration would be one of the few acts ever to be proposed to help the "shirt-tail operator." An assured pipe-line connection, he said, will keep many of the stripper fields in production until they are exhausted, while without low-cost transportation and a fair price these fields would have to be abandoned.

The purchasers' side . . . Bandy, on the other hand, said if his firm is forced "to buy crude where it's uneconomical or whether I need it or not, I'll be forced to go out of business." L. B. Simmons, retired official of Deep Rock Refining Co., said the small refiner operates on such a small margin of profit that he couldn't absorb the hauling costs which would follow passage of the bill. Likewise, he said, pipe lines and gathering units should not be forced to build lines into areas where the production is too small to amortize the lines.

More than 100 oil men attended the hearing.

A.P.I. Production Meet Near

TULSA.—The Mid-Continent district spring meeting of the American Petroleum Institute Division of Production will be held at the Mayo Hotel here March 18-20.

Meetings of special committees will be conducted the opening day of the conference. Technical papers to be presented March 19-20 include:

Thursday, March 19 . . . "Factors Affecting the Angle of Inclination of Rotary Bore Holes," Arthur Lubinski, Stanolind Oil & Gas Co., Tulsa, and Henry B. Woods, Hughes Tool Co., Houston; "The Effects of Use of Oil in Drilling Fluids," J. L. Lummus, Stanolind Oil & Gas Co., Tulsa, H. M. Barrett, Phillips Petroleum Co., Oklahoma City, and Harry Allen, Carter Oil Co., Tulsa; "Removal of Flow Restrictions in Well Completions," Charles Clason and Wayne F. Hower, Halliburton Oil Well Cementing Co., Duncan, Okla.

Friday, March 20 . . . "Equipment Trends in Shaped Charge Perforating," Maynard L. Russell and G. L. Gore, Dowell Incorporated, Tulsa; "Are You a Supervisor?" R. B. Sale, Continental Oil Co., Ponca City, Okla.; "Cathodic Protection of Steel Vessels Exposed to Oil Fields Brines," Cecil O. Smith, Carter Oil Co., Tulsa; "Application of Hydraulic Fracturing to the Stimulation of Oil and Gas Production," Roscoe C. Clark, Continental Oil Co., Ponca City; "Water Flooding—Fankhauser Unit, Greenwood County, Kansas," J. D. Walters, Sunray Oil Corp., Tulsa; "High Pressure Gas Injection-Mechanism of Recovery Increase," R. L. Slobod and H. A. Koch, Jr., Atlantic Refining Co., Dallas; "Artificial Brain is Required for the Solution of Sucker Rod Problem," M. H. Halderson, Phillips Petroleum Co., Bartlesville, Okla.

Navy to Quit Alaska

Nine-year oil hunt to end after unsuccessful expenditure of $45,000,000; plans for insulated crude line revealed

Bertram F. Linz

WASHINGTON.—The Navy Department is abandoning its quest for oil in Alaska after having expended approximately $45,000,000 since 1944 on an exploration program which has resulted in no commercial discoveries.

The decision to pull out was disclosed by Secretary Robert B. Anderson in an open-hearing "consultation" with the House Armed Services Committee at which he heard Rep. Leon H. Gavin of Pennsylvania compare the Alaskan program with the wartime "Canol" project which cost the country $138,000,000 and was abandoned 10 days after it was elaborately dedicated.

As the committee opened its discussion of activities in Naval Petroleum Reserve No. 4, Chairman Dewey Short of Missouri said it was the "overwhelming opinion" of the committee that the project should be terminated.

In a report to the committee, Gavin said a total of $52,765,000 has so far been appropriated by Congress for the work and that the former democratic administration proposed to continue the program through 1955 and close it out in 1956 at the cost of another $25,000,000. That sum, plus some $7,000,000 of unexpended funds and some recovery from more than $6,000,000 of material on hand, will be saved by Anderson's decision.

Transportation problem . . . Gavin pointed out that Point Barrow is closed in 10 or 11 months of the year and that even if oil was found in commercial quantities the problems of transporting it out would be "staggering." A pipe line just to get the oil as far as Fairbanks, 500 miles away, would cost $150,000,000, and in the long run it was the Navy's intention to get out once oil was found and leave development to private enterprise.

"Let private enterprise carry on their own exploration," Gavin suggested.

"I am in substantial agreement, at least, with Mr. Gavin," Anderson told the committee. "I would like to suggest that all operations be suspended as of now and no appropriation be asked for in 1954."

Anderson explained no drilling operations are going on in the reserve at the present time and it would be simply a matter of withdrawing material and people.

Pipe-line study . . . Although no oil was discovered in the reserve, the Navy was experimenting with pipe-line construction which would be needed to move it if found, it developed during the discussion.

This experimentation centered around the use of tundra above and below pipe laid 3 or 4 ft. underground, but it was found that tundra would be available along only a short part of the distance the line would have to go and some other form of insulation would be required.

Orderly closeout . . . In Fairbanks, Alaska, J. R. Coleman, project manager for Arctic Contractors, Inc., which has been doing the work for the Navy, said present plans call for an orderly end to operations.

Some equipment will be returned to the United States by ship during August. Most personnel connected with drilling operations, he said, "will be terminated in the very near future" while some in the financial end or connected with various construction activities would remain longer.

Development Terms Revealed

BARTLESVILLE, Okla. — Phillips Petroleum Co. and Kerr-McGee Oil Industries, Inc., have negotiated a general agreement providing for the exploration and development of the Katalla-Yakataga area of Alaska.

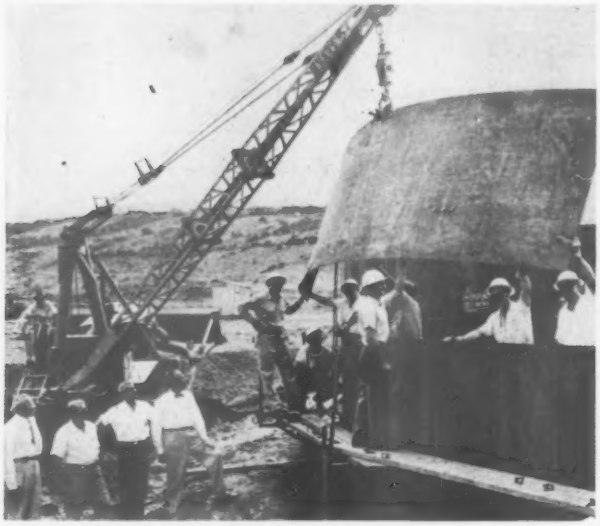
Under the agreement, Phillips will operate the properties, and Kerr-McGee will do the drilling and take a one-half interest in the venture. When the agreement sharing interest in the project is written and executed, it will be submitted to the Department of Interior for its approval.

Phillips said it became interested in the area early in 1952 and subsequently executed operating agreements with 416 individuals who had filed lease applications in the area and with 13 individuals holding leases.

The Interior Department on February 6 approved the issuance of a block of more than 500 leases covering near 1,000,000 acres in the area *(The Oil and Gas Journal, February 16, page 94)*. Phillips, under terms of the contract, was required to drill 12 tests over a period of 10 years, 6 in each of two districts, and to spend a minimum of $1,200,000 for exploration by June 30, 1956, and thereafter an annual minimum sum equal to 40 cents per acre.

Preliminaries Are Expensive

The cost of drilling a well often is small compared to the expense incurred before the rig actually begins to make hole. Here is a typical portion of an 80-mile road which Cities Service Oil Co. had to hack out of the Canadian wilderness to reach a location at Lubicon Lake in northern Alberta. Just cutting trees and bulldozing a strip through forest, swamp, or mountains isn't enough on projects like this. The roads have to be engineered carefully to stand up under the heavy loads of equipment and supplies carried over them to the drill sites. (Cities Service photo).



ERECTION OF PROCESS STORAGE vessels for the new Durban refinery commenced in January. Here the first plates are swung into position by Chicago Bridge & Iron workmen as refinery officials look on.

PIPE-LINE SYSTEM between Durban Harbor and the refinery (about 4½ miles) consists of one 10-in. for crude oil, one 8-in. and two 4-in. for products.

AFRICA

Progress at Durban

Process units arriving at site of Standard-Vacuum's new 15,600-bbl. plant on east coast of Union of South Africa

A NEW 15,600-bbl.-daily refinery is gradually taking shape near Durban, on the eastern coast of the Union of South Africa.

The plant is being built by Foster Wheeler Corp. for Standard-Vacuum Refining Co. of South Africa (Pty), Ltd. It will be the only refinery on the African continent other than those on the Mediterranean in Egypt and the French Morocco-Algeria area.

Cornerstone ceremonies marking the commencement of construction operations were held April 25, 1952, and the work is moving ahead toward an anticipated completion early next year. Tankage now is partly erected, and process units are arriving at the site.

A 4½-mile pipe-line system which will carry crude to the refinery and deliver products to Durban Harbor now is virtually completed. Last year, Foster Wheeler crews laid a 6-in., 1,050-ft. underwater line in Durban Harbor to be used to carry fuel oil to a ship bunkering terminal.

Combination unit . . . Of particular interest in connection with the refinery design is the fact that the main process unit will combine functions of crude distillation, catalytic cracking, and thermal reforming. Capacity for catalytic cracking will be about 9,700 bbl. daily, and 2,000 bbl. daily for thermal reforming. Other facilities include a 1,800-bbl.-daily SO_2 extraction unit. A later addition to the refinery plans provides for an asphalt plant to produce about 25,000 long tons annually.

The new refinery will operate on Middle East crude. The 214-acre site at Wentworth near Durban gives proximity to deep-water tanker terminal facilities.

Somaliland Rights Sought

Moriqui Exploration Co. has filed for two concessions totaling about 12,000 sq. miles in British Somaliland. Although no official confirmation has been received, the company has been advised that the concessions will be granted.

Dr. A. W. Kew represented Moriqui in the negotiations and last September visited the area to inspect the properties and negotiate details. Preliminary plans were approved by British officials in November.

The larger concession borders on the Gulf of Aden, extending eastward from Berbera approximately 100 miles and inland up to about 70 miles. The other is southwest of Hargeisa, bounded on the west and south by the Ethiopian border.

Two oil seeps have been found on these properties and one exposed oil sand. Faulting is said to exist, and there is evidence of structure.

The company expects to start initial geological work later this year and will spend about 2 years making the studies.

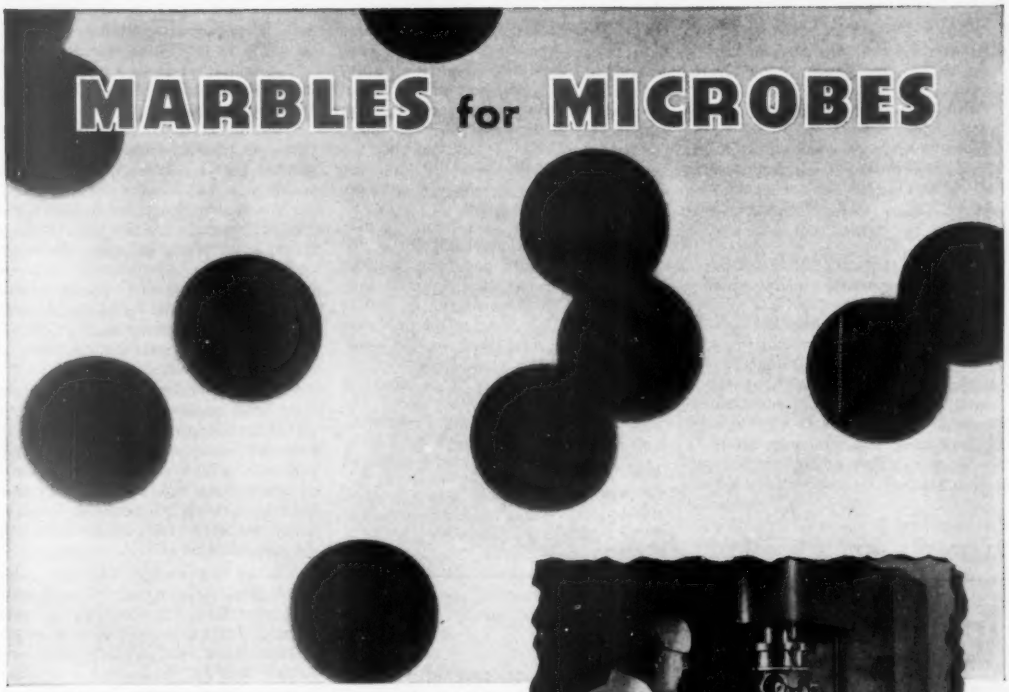
New Oil Law

Egypt lifts biggest blocks to resumption of operations

A NEW and reportedly workable petroleum law has been decreed in Egypt, but the two main operating companies are still waiting for a settlement of the price question on oil sold on the domestic market.

The new decree law removes two main objections to the 1948 Mining Law—provisions for possible Egyptian stock control of a company, and the lack of the usual automatic concession-

MARBLES for MICROBES



Above—100,000X enlargement of latex spheres used to calibrate electron microscope in Nalco Laboratories. Actual diameter of spheres is 0.25 microns—.00000975 inches! Right—Inserting specimen holder in vacuum chamber of Nalco electron microscope.

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New reprint of A.S.M.E. Paper No. 52-A-30: *Experimental Studies of Boiler Tube Metal Temperatures: Effect of Heat Transfer Rate and Deposit Thickness*, gives technical data on high-heat-transfer-rate effects (140,000 to 300,000 Btu/sq. ft./hr.) at pressures from 250 to 2500 p.s.i. 16 pages, with tables and diagrams. Author: C. Jacklin, Director, Engineering Research, National Aluminate Corporation.

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conversion feature under which an operator is guaranteed he will get the right to produce whatever oil he discovers.

Terms of the new decree law include provisions for a 4-year nonexclusive exploratory period, renewable for another 4 years if a prospecting party is working continuously. Exploration in the western desert area of Egypt is encouraged by special rent and royalty terms.

Operations dormant . . . The unfavorable provisions of the 1948 law resulted in the withdrawal of Standard Oil Co. (N. J.) from the country and the subsequent ending of all drilling by the two remaining companies, Anglo-Egyptian Oilfields, Ltd. (Shell), and Socony-Vacuum Oil Co., Inc. The existing fields of these two companies are in or approaching a state of decline, and output is expected to drop this year.

The Egyptian Government for years held prices of products sold on the local market to a level below prevailing world prices. In 1951, the government reached an agreement with the companies on this problem. However, the agreement subsequently was invalidated by the government, with the result that the companies claim the government owes them some £2,000,000.

More waiting . . . Another point of difference between the companies and the government is over the reported cancellation by the government, on orders of the Council of State, of the previously granted licenses held by the companies for 61 areas. Reports from London indicate that it is doubtful whether either of the two companies will be ready to resume exploration and development work until these other outstanding questions have been cleared up.

MIDDLE EAST

Injunction Denied

Anglo-Iranian loses second round in test to see who owns Iranian oil when Venice court rules nationalization legal

AN Italian court in Venice handed down an opinion March 11 denying an application by Anglo-Iranian Oil Co., Ltd., for an injunction impounding about 31,000 bbl. of fuel oil exported from Iran in January in the tanker Miriella.

The Italian judge held that in his opinion the Iranian oil nationalization laws were legal. The effect of the ruling is to allow the Italian export company, Supor, to sell the cargo while Anglo-Iranian presses the case in other Italian courts.

The British company is instituting proceedings before the Tribunale Di Roma in Rome for a full legal determination of the ownership question. Anglo-Iranian contends it still has legal rights to the oil, since no compensation was paid for its Iranian properties.

The Venice decision is expected to encourage other attempts to move oil out of Iran, despite Anglo-Iranian's announced plan to lay claim to such cargoes. The Miriella's cargo was the second lifted from Iran since the British were expelled in 1951. Anglo-Iranian won the first such case, involving the tanker Rose Mary, in a British court at Aden.

Final settlement offers . . . Meanwhile, in Teheran, Iranian Government officials were studying terms of what is now considered to be the final United States-British proposals for settlement of the oil-nationalization dispute.

The government's decision is expected in the near future. There have been indications that Prime Minister Mossadegh and his advisers will balk again. However, Iranian politics are so fluid and unpredictable that some kind of qualified acceptance would not be surprising.

The United States and British governments in effect served notice in Iran last week that it can expect no better terms than those contained in the proposals delivered February 20 by Loy W. Henderson, U. S. ambassador in Teheran.

A joint communique issued in Washington at the conclusion of the discussions between Secretary of State Dulles and British Foreign Secretary Eden devoted five paragraphs to the Iranian impasse. This statement said the February 20 proposals were the result of "careful study of all factors involved" and added that the United States Government considers the offer "reasonable and fair."

Details still not public . . . Only the broad outlines of the United States-British offer have been made public. Last week's communique said that Iran would retain control of its industry and oil policies, would have full opportunity to sell oil in world markets, and would receive sufficient funds, to be repaid in oil, to meet its immediate financial problems.

All along it has been indicated that the issue of compensation for Anglo-Iranian Oil Co., Ltd.'s, properties was the main point of difference. The British are reported to believe this should include payment for the loss resulting from cancellation of the concession agreement some 40 years before it expired. In the past the Iranians have insisted that this and certain other considerations be excluded in any submission of the compensation question to international arbitration.

The Dulles-Eden communique said that "the problem of compensation would be disposed of in such a way that there would be no sacrifice of the principles which form the very basis of international intercourse among free nations, and the payment of compensation would be fully compatible with the rehabilitation of Iran's economy."

The statement said that the sales which Iran could arrange in world markets would be "at competitive world prices." The question of price at which Iranian crude and products would be turned back on the market is of considerable significance. The amount of the discount to any international marketing company and whether this would be extended by Iran to spot buyers would have an important bearing on future operations.

Control reasserted . . . Dr. Mossadegh's government seemed to be firmly in control of the situation in Teheran last week following the riots which for a time threatened to unseat the prime minister.

Nearly 100 political opponents of the regime were jailed, and several newspapers closed down. The government also moved against the Bakhtiari tribesmen who have been in a virtual state of revolt. A new army commander was appointed for the provinces of Isfahan, Fars, and Khuzistan with orders to take stringent measures. The now-idle Abadan refinery and the producing fields are located in Khuzistan Province.

New Kuwait Strike

K.O.C. gets oil discovery northeast of Burgan field

KUWAIT OIL CO., LTD., has found new oil production on the Ahmadi Ridge northeast of Burgan field proper.

Further drilling in the area has been suspended while additional seismograph work is carried out. The discovery was

brought in at approximately the same depth as the regular Burgan field wells which average around 4,600 ft.

The Ahmadi Ridge well was located about 6 miles northeast of the outer limits of Burgan field and about 7 miles southeast of the new Magwa area. It is due east of the section between Burgan and Magwa which has not yet been drilled by the company.

Test results of the Ahmadi discovery were not given. In Burgan field itself, the usual first and third sand well produces about 5,000 bbl. daily, while a third and fourth-sand dual producer is good for around 9,000 bbl. daily. Gravity of the crude averages about 31.8° A.P.I.

The ridge on which the discovery was made is understood to mark a line of folding separate from that of Burgan and Magwa. The discovery well is only a short distance away from the company tank farm which is located on the ridge just south of the company town, Ahmadi.

Magwa active . . . The Magwa area was brought into commercial production February 17 following completion of the gathering lines and the separator plant. Three rigs now are running in this area, drilling wells Nos. 11, 14, and 15. The Magwa separator facilities are tied into the Ahmadi tank farm.

The successful test at Ahmadi continues the Kuwait drilling record of no dry holes since the first well drilled in the field struck oil in February 1938. Several years ago, K.O.C. unsuccessfully tested the deeper formations in the field in a well which went to 13,853 ft. but this was later completed in the regular Burgan sands. In 1936—before the first Burgan well—the company drilled one wildcat in the northern part of the shaikhdom which was unsuccessful. The Magwa discovery was made in October 1951 in the first exploratory drilling since the original Burgan discovery.

Burgan is considered the world's largest single oil reservoir, though it may eventually be equalled or exceeded by the Ghawar area in Saudi Arabia. Kuwait's total reserves have been unofficially estimated at 20 billion barrels. The Magwa discovery added substantially to the 15 billion barrels credited previously for Burgan, and from this standpoint was a development of major significance in oil operations in the Middle East.

EUROPE

Spanish Test Near

Texas operators to drill first wildcat near Tudela

A TEXAS group in the next few weeks is expected to begin drilling its initial wildcat test on a new exploratory concession in northeastern Spain.

The location is in the Upper Ebro River Valley about 22 miles north of the town of Tudela and about 150 miles northeast of Madrid. Seismograph work has been under way in the area for several months.

The United States interests participating in the program include General American Oil Co. of Texas, Delta Drilling Co., and Texas Instruments, Inc. DeGolyer & MacNaughton are reported to be interested through assistance in the geological and geophysical investigation. Also participating is George E. Crammer, retired Denver banker who first became interested in the area about 2 years ago during one of his travels as a tourist.

Deep test . . . Delta Drilling is in charge of the wildcat operation. A Delta crew left Tyler early in February. Although the first well is slated to go to about 11,000 ft., the rig, which was shipped earlier from the United States, has capacity for about 15,000 ft. if necessary.

Morris E. Hays, formerly with Delta at Odessa, has been in Spain since the first of the year making preliminary arrangements for the drilling program. Christian Zeppa, head of Delta, also has been in Spain recently to supervise unloading and movement of the rig.

The United States group is working under contract with I.N.I. (the government's Instituto de Nacional de Industria) and is expected to invest about $1,000,000 in the undertaking. If commercial production is found, a joint company will be formed in which I.N.I. will receive about 55 per cent of the stock. The United States investors would be allowed to withdraw profits in dollars provided Spain's foreign exchange position is not prejudiced. The peseta expenses for the exploration will be made available by I.N.I.

The area over which the group holds exploratory rights covers about 180,000 acres and extends southeast from the town of Logrono. Previous exploration for oil in Spain has been unsuccessful, and there is now no indigenous production in the country.

LATIN AMERICA

Exploration Up

Activity continues high as production, demand slump

ALTHOUGH production and demand are expanding at a less rapid rate than a year ago, exploratory activity in Venezuela continues to show a slight increase.

During December, 42 geological and geophysical parties were active. This total compares to the 40 parties which were in the field in December 1951.

By company and type of work, the party total at the end of last December was broken down as follows: Creole, four geological, two seismograph, and one gravity meter; Mene Grande, two seismograph, one structure drill, and one geological; Phillips, one geological, one seismograph, and one gravity meter; Shell, five geological, one gravity meter, and five seismograph; Richmond, four geological, and one seismograph; Sinclair, one seismograph; Las Mercedes, one seismograph and one structure drill; Socony-Vacuum, two geological and three seismograph; Texas, one geological and one seismograph; Venezuelan Atlantic, one seismograph and one structure drill.

Production slips . . . Production in Venezuela hit an all-time high in December of 1,861,000 bbl. daily following a slump during the summer. Despite the heavier winter consumption of fuel oil, January output in the country dropped off nearly 70,000 bbl. daily to 1,792,100 bbl. daily.

Early in February, Creole was reported to have about 75,000 bbl. daily of heavy (10°-21° gravity) crude shut in in the Lake Maracaibo area. Shell had about 70,000 bbl. daily of this type of crude also closed in in the same area. Some Venezuelan oil still is going to replace what was lost through the nationalization in Iran. In this connection H. W. Haight, Creole executive vice president, in a recent talk in Caracas remarked that Venezuelan production would have to be reduced by approximately 100,000 bbl. daily if Iranian oil were to enter world markets at this time with success.

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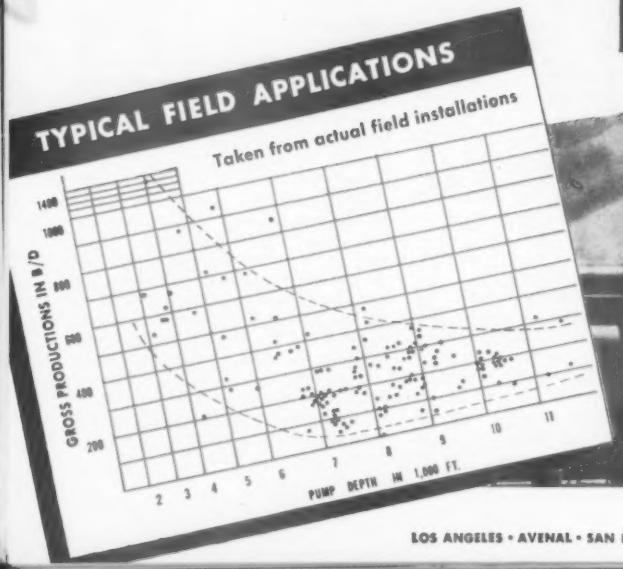

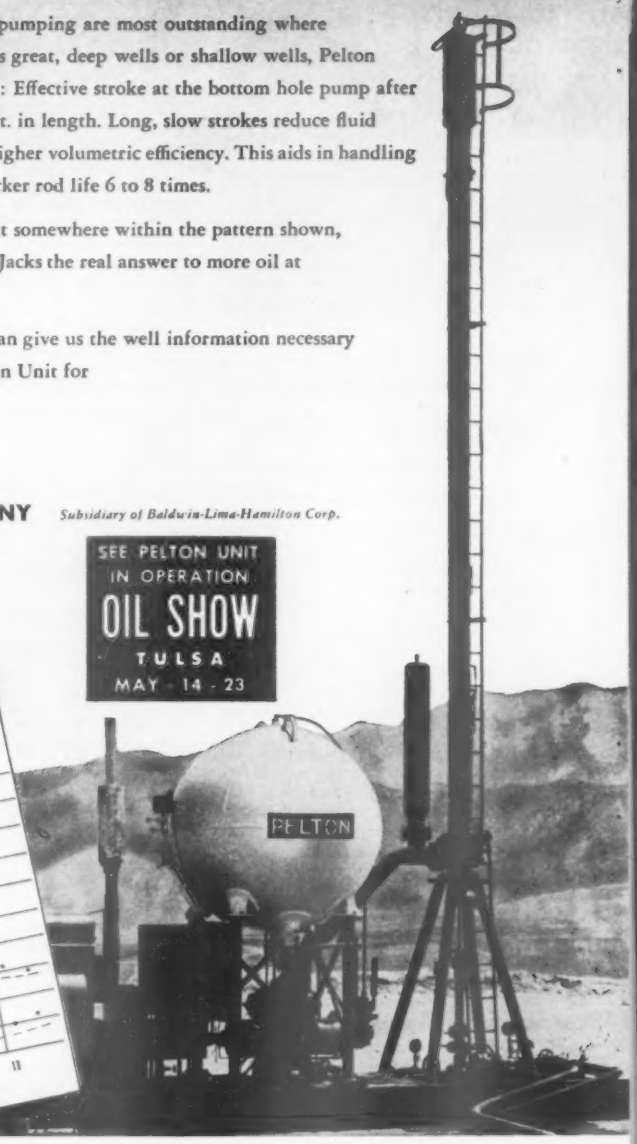

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Manufacturing Head

Harper, refinery veteran, gets new Aramco position

S. C. HARPER has been active in the refining end of the oil business both in this country and in Saudi Arabia.

He recently was appointed manager of the manufacturing and oil-supply department of Arabian American Oil Co. in New York. Previously he was assistant to the vice president of technical and supply services.

His career began in the shipping department of The Texas Co.'s Port Arthur, Tex., refinery in 1927. A year later he was transferred to Texaco's executive offices in New York, where he held various refining positions for the next 11 years.

In 1939 he returned to Texas as a chemical engineer in Texaco's San Antonio refinery, and the following year he became a process engineer in the Lawrenceville, Ill., refinery.

Following the outbreak of World War II he was recalled to New York to coordinate procurement of chemicals and supplies for Texaco refineries. Later he joined the staff of process engineers working on aviation-gasoline manufacture and was assigned to the Wilmington, Calif., refinery.

He joined Aramco in October 1944 and early the next year became head of research and development engineers at the refinery under construction at Ras Tanura, Saudi Arabia. When construction of the plant was completed, he returned to the United States as technical advisor to the vice president in charge of refining. In January 1948 he was appointed assistant to the manager of manufacturing and processing in New York.

Harper returned to Saudi Arabia in 1948 as staff manager of refining in Dhahran. He was recalled to New York 3 years later and became assistant manager of manufacturing and supply and then assistant to the general manager of oil operations.

He is a native of South Arkansas and attended Columbia University and Polytechnic Institute of Brooklyn, where he received a degree in chemical engineering.

George B. Holden has resigned as a petroleum engineer for the Louisiana Department of Conservation in Baton Rouge. He will establish an office there as a petroleum consultant.

W. C. Koger has been named head of the Cities Service Oil Co. oil-production division's corrosion and oil-treating section. He will maintain his office for the present at Great Bend, Kans., where he has served since 1946 as a corrosion and oil-treating engineer.

Jay C. McWilliam, North Louisiana district production superintendent for Continental Oil Co. at Ville Platte, La., has been appointed East Texas district production superintendent. **A. A. Anders** has been transferred from East Texas to Midland, Tex., where he was promoted to West Texas-New Mexico division production superintendent. **K. M. Hammond** has been named to succeed McWilliams at Ville Platte.

M. K. Sween, senior production engineer for Sunray Oil Corp., has resigned to become general superintendent for Santa Maria Drilling Co., Long Beach, on April 1. He joined Sunray in 1948 and previously was in the pipeline, natural-gas, and petroleum-engineering departments of Union Oil Co.

M. J. Deuth has been transferred from Shell Oil Co.'s New York offices to Casper, Wyo., where he is senior geologist in the Rocky Mountain division offices. Other recent changes in the West Coast area exploration department include: **Theodore Cook,** paleontologist, transferred from Ventura, Calif., to the Houston area office; **Stanley Day,** geologist, moved from Ventura to New Orleans; **J. G. Jackson,** promoted from junior geologist to geologist at Ventura; and **T. L. Kirby,** shifted from geologist in the Rocky Mountain division office to district geologist at Casper.

J. M. Shepherd has been named superintendent of the district offices which Humble Oil & Refining Co. recently opened at its Rosedale properties west of Bakersfield, Calif. **F. X. Pendarvis** has been appointed district petroleum engineer and **R. M. Smith** and **J. H. McDonald** have been appointed production geologists.

J. E. Lang has been promoted to assistant division engineer for Stanolind Oil & Gas Co. at Casper. He formerly was district engineer at Cody, Wyo. Other company changes involve: **D. H. Falkingham,** field engineer at Rangely, Colo., promoted to district engineer at Cody; **G. A. Wilson,** production foreman of the Little Buffalo basin area, promoted to field superintendent at Thermopolis, Wyo.; and **H. V. Wood,** petroleum engineer at Rangely, promoted to field engineer there.

J. W. Hoover has resigned as vice president in charge of the exploration department and as a director of The California Co., New Orleans, to become president of Chevron Oil Co. Both companies are wholly owned subsidiaries of Standard Oil Co. of California.

W. L. Matjasic, Honolulu Oil Corp.; **Harold Rader,** Standard Oil Co. of California; and **B. C. Lupton,** General Petroleum Corp., have been elected representatives of the Los Angeles district of the Pacific Coast section of the American Association of Petroleum Geologists. **R. C. Shelton,** Ohio Oil Co., has been selected to represent the Santa Barbara district and **S. A. Carlson,** Richfield Oil Corp., and **R. L. Hewitt,** Trico Oil & Gas Co., have been elected for the Bakersfield area.

Eugene Holman, president of Standard Oil Co. (N. J.), New York, and **James D. Black,** president of Pacific Gas & Electric Co., San Francisco, have been appointed by **President Eisenhower** as members of a 7-man group of consultants to the National Security Council. The members of the group will be consulted as individuals, rather than as a committee, on problems of the NSC. Conferences are being arranged at which they will be briefed on the work of the council by officials of the state, treasury, and de-

PERSONALS

A.P.I. Southwest District Officers

New officers of the southwestern district of the A.P.I.'s Production Division (left to right) are: W. B. Duncan, Houston Oil Co. of Texas, Houston, chairman of the advisory committee; J. D. Exner, Humble Oil & Refining Co., Wichita Falls, vice chairman for North Texas; Raymond E. Meleton, Arkansas Fuel Oil Co., Shreveport, vice chairman for Arkansas-Louisiana; Louis F. Davis, Atlantic Refining Co., Dallas, chairman of the southwestern district; R. M. Freeman, San Antonio, retiring vice chairman; C. L. Bramlett, Halliburton Oil Well Cementing Co., Corpus Christi, vice chairman for Southwest Texas; and Ray Elner, Kobe, Inc., Fort Worth, vice chairman for Central Texas. Other new chairmen, not shown, include: Don Miller, Phillips Petroleum Co., Midland, West Texas; T. J. Fuson, Humble Oil & Refining Co., Houston, Texas Gulf Coast; W. S. Crake, Shell Oil Co., Kilgore, East Texas; R. K. Guthrie, Seeligson Engineering Committee, San Antonio, Balcones area; Weldon Ramseur, Gulf Refining Co., Laurel, Miss., Alabama-Mississippi; John Shannon, Magnolia Petroleum Co., Lake Charles, La., southern Louisiana; Dan Bodie, Cities Service Oil Co., Hobbs, N. M., Southeast New Mexico. The new treasurer for the district is George Gray, Baroid Sales Division, National Lead Co., Houston.

fense departments, Atomic Energy Commission, Mutual Security Agency, and Central Intelligence Agency.

James E. Thompson, executive vice president of Samedan Oil Corp., Ardmore, Okla., has been elected president of the board of trustees of the Samuel Roberts National Foundation, Inc.

David E. Gee has been appointed a geologist for Fain & McGaha at Wichita Falls, Tex. For the past 5 years he has been a geologist for Continental Oil Co.

W. E. McKitrick, manager of Shell Oil Co.'s exploration activities in the San Joaquin Valley division, has been transferred from Bakersfield to the Los Angeles area office on a special assignment. During his absence **W. A. Stokesbary,** division stratigrapher, will act as exploration manager.

N. W. McCrae, superintendent of Imperial Oil, Ltd.'s Sarnia, Ont., refinery, has been transferred to Halifax as superintendent of the Imperial refinery, succeeding **R. D. King,** retired. **G. R. McMillin,** formerly assistant superintendent at Sarnia, has been promoted to superintendent.

G. L. Colpitts, formerly management assistant of western producing operations for Imperial Oil, Ltd., has been transferred from Calgary to the company's headquarters in Toronto, where he becomes operations adviser for the producing department. **V. H. Hunter** was promoted from district superintendent at Redwater to succeed Colpitts at Calgary.

Thomas F. Bailey has opened offices as an independent consulting geologist in Casper, Wyo. He formerly was with Amerada Petroleum Corp.

Dr. Robert C. Spivey has been appointed senior geologist for Shell Oil Co. at Los Angeles. For the past 4 years he has been area stratigrapher in Midland, Tex. He started his career with Shell in 1940 and prior to that served 2 years as a member of the faculty at the University of Iowa.

G. E. TEMPLE

George E. Temple, formerly an assistant works manager at Anglo-Iranian Oil Co.'s Abadan refinery, has been appointed vice president and general manager of Catalytic Construction Co. of Canada, Ltd., Sarnia, Ont. He succeeds **G. R. Henderson,** who resigned recently to become manager of the new Sarnia refinery of Sun Oil Co.

Dell C. Wade, formerly a petroleum engineer for Stanolind Oil & Gas Co. at Corpus Christi, has been appointed a petroleum engineer for Crown Central Petroleum Corp. at Houston.

Earl D. Wallace, who recently resigned as president and director of Sohio Petroleum Co. and as a vice president and director of Standard Oil Co. (Ohio), has become a consultant to Dillon, Read & Co., Inc., on oil and gas matters.

W. R. Lund, senior exploitation engineer for Shell Oil Co., who has been in The Hague, Netherlands, on special assignment, has been promoted to area production superintendent at New Orleans.

Herbert T. McMeekin, Jr., has resigned as assistant to the vice president of Deep Rock Oil Corp. in charge of the land and exploration division to join the oil department of Loomis, Sayles & Co., Inc., investment counselors, Boston.

James R. Head, engineering trainee for Stanolind Oil & Gas Co. in the Gorham, Kans., area, has been promoted to junior patent engineer at Tulsa.

Robert L. Augenthaler, superintendent of exploration for the central division of Standard Oil Co. of Texas, has been elected president of the San Angelo (Tex.) Geological Society. Other officers include **John D. Hill,** vice president, and **John McCammon,** secretary-treasurer. Hill is an independent operator and McCammon is manager of the San Angelo district for La Gloria Corp.

R. L. Wales has been named assistant manager of the Oklahoma division of The Texas Co.'s producing department at Tulsa, effective April 1. He now is assistant to the manager of the geophysical division, in charge of Canadian geophysical operations at Calgary. In Tulsa he will replace **Harvey Cash,** who has been transferred to the company's foreign operations department in New York.

PERSONALS

Arrow Management Meeting

Representatives of Arrow Drilling Co., Arrow Drilling Co. of Texas, and Arrow Drilling Co. of Canada, Ltd., are shown at a recent meeting in Tulsa in which they discussed drilling organization, equipment, work performance, and research. Left to right, bottom row, are: S. M. Blevens, Ted P. Bartlett, Louis Roark, and J. E. Lee, and top row, M. D. McBride, Lloyd Hanson, R. C. McReynolds, I. H. Patton, Jr., W. S. Churchill, George J. Churchill, George Allen, James Parker, and D. L. Edmiston. Not shown in the photograph is J. E. Curran.

Troy C. Kadel, assistant district superintendent for Sinclair Oil & Gas Co., has been transferred from Crane to Eldorado, Tex.

Norman G. Kitrell, petroleum engineer for The Texas Co. at Houston, has been promoted to district petroleum engineer at El Campo, Tex.

W. H. Burke has returned to his duties as area production manager for Shell Oil Co. at Tulsa. He was appointed to that position in 1947 and was transferred to New York in September 1951. **C. P. Bristol,** present production manager for Shell in Tulsa, will undertake a special assignment for the next several months.

M. M. Keeble, district superintendent for Magnolia Petroleum Co., has been transferred from the Kermit, Okla., producing district to the newly created SACROC Two district at Snyder, Tex. Other company changes involve: **J. M. McLaughin,** assistant district superintendent, transferred from the Brownfield producing district to the SACROC Two district; **E. G. Blundell,** promoted from assistant district superintendent of the Kermit district to district superintendent; **Robert W. Lewis, Jr.,** formerly assistant division petroleum engineer at Midland, Tex., appointed assistant district superintendent of the Kermit district; **J. H. Brewer,** promoted from producing foreman in the Pegasus producing district to assistant district producing superintendent of the Brownfield district; **Cyrus O. Turner,** assistant foreman at Duncan, Okla., promoted to producing foreman in the Kermit district; **Marion W. Lovelace,** assistant foreman in the Pegasus district, promoted to production foreman; **Albert W. Shaw, Jr.,** petroleum-engineering assistant in the Kermit district, promoted to assistant production foreman in the Pegasus district; and **Ernest B. Etheridge,** assistant foreman in the Shreveport producing district, promoted to production foreman.

J. K. Ringland has been elected president of Long Island Petroleum Co. of New York. **T. D. Mellon** has been elected vice president. The firm is active in western Canada, Mid-Continent, and Rocky Mountain fields.

L. G. Childers, formerly tool pusher, has been promoted to general superintendent of Tine Gaiser Drilling Co., Bakersfield, Calif.

Dewey K. Davis, toolpusher for Penrod Drilling Co. at Ruston, La., has been appointed drilling superintendent at Shreveport.

G. L. Rowsey has resigned as president of Taylor Oil & Gas Co., Taylor, Tex., but will remain as chairman of the board of directors. He has been succeeded by **James L. Sewell,** who had been vice president of manufacturing and an employe of the company since 1933.

DEATHS

Thomas Logan Weaver, 79, Fort Worth, who drilled some of the first wells in Ranger and Cisco fields, died in Fort Worth March 5. With a brother, the late T. B. Weaver, Wichita, Kans., he owned Weaver Brothers Drilling Contractors. The company was dissolved in 1938.

Raymond V. Darby, 56, Los Angeles County supervisor, died March 5. Following World War I he served for a period as a geologist for Empire Gas & Fuel Co. at Bartlesville, Okla.

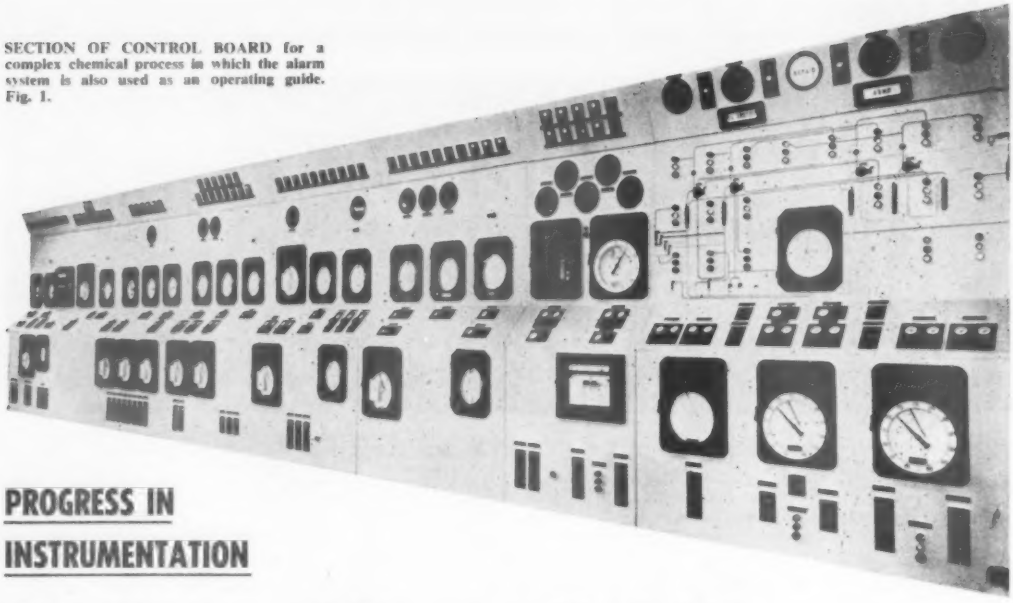
George Edwin Dorsey, 60, geologist for Socony-Vacuum Oil Co., died of a heart attack in New York City March 7. He obtained a Ph.D. degree in geology from Johns Hopkins University in 1918 and had been associated with the Maryland Geological Survey, the U. S. Geological Survey, Carter Oil Co., and Magnolia Petroleum Co.

Cervantes A. (Van) Shepard, 55, president of Inter-State Oil Co., Kansas City, Kans., was killed recently in an automobile accident.

Richard B. Pedersen, 57, formerly a sales engineer in Oklahoma for Continental Oil Co., died recently in Winslow, Wash.

Claude R. Page, 55, shop superintendent for Lone Star Gas Co., died March 6 at his home in Dallas.

John Morris Jennings, 58, Mid-Continent manager for Bishop Oil Co., died March 5 in Houston.



SECTION OF CONTROL BOARD for a complex chemical process in which the alarm system is also used as an operating guide. Fig. 1.

PROGRESS IN INSTRUMENTATION

Monitoring of Process Variables

Developments in the next decade will not be directed toward the automatic plant, but will enable the human operator to extend his scope and be more efficient. Better monitoring of process variables is one means to this end.

by Albert F. Sperry*

A NUMBER of factors are contributing to make the automatic scanner increasingly important in modern process control: (1) An increased number of repetitive readings are required. (2) Demands on the operator's judgment and speed of reaction are increasing. (3) Development of new processes means greater requirements for large masses of information for purely research and statistical analysis. (4) Standard components such as decade switches and master units, automatic teletype recorders and standard digital converters continue to be developed.

Flexibility can be increased with standard components to such an extent that large systems can be built up entirely around standard units in a manner very similar to the remainder of the control board. This will eventually bring the cost per point monitored down so that the scanner can compete with the ordinary indicating system even in systems below 100 points, and thus a new tool will be placed in the hands of the designer of the modern process control system.

*Panellit, Inc., Chicago. Presented at symposium on Instrumentation for the Process Industries, A. & M. College of Texas, 1953.

SUMMARY CHART ON SCANNERS

A scanner consists of any combination of the devices described in this article. When designing a scanner any of the devices listed in the table can be included but the particular combination depends on the type and amount of information that must be presented to the operator and the equipment which he must operate.

Primary Element	Switching System	Measuring System	Position Indexes	Alarm Indication
Thermocouple	(a) Electrically operated stepping switches	Galvanometer	Lamps, for each point	Annunciator and horn
Resistance bulb	(b) Relay trains	Null potentiometer	Lamps, coordinate	Coordinate lamps
Differential transformer	(c) Mercury jet switch	Electric amplifier	Pulse indicators	Gaseous tube indicators
Capacitors	(d) Motor-driven switches		Telemeters	Telemeters
Variable inductors				Graphic light displays
Any electrical transducer				

Measurement Indication	Recorders	Manual Setting Devices	Auxiliaries
Continuous or abnormal only	Circular chart	Telephone dial	High-speed secondary scanners
Synchros	Strip chart	Manual coordinate seeking	Recorders or indicators
Galvanometers	Segmental chart	Manual point seeking	Interconnection patching panel
Potentiometers	Automatic typewriter	Variable speed	Hi-Lo control
Oscilloscope	Automatic printer	Bank or row bypass	Panel board or console
	Perforated tape	Bank or row repeat	
	Perforated card	Group or individual alarm limit adjustments	
	Magnetic wire or tape		
	Photographic		

The recent developments in transistors have led us to expect that more and more compact memory devices might be available in the near future. But even using these advanced techniques, a machine with a memory equivalent to the human brain would probably be bigger than New York's Radio City.

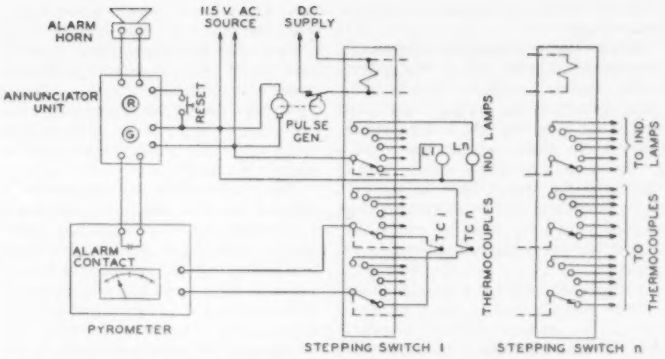
The human operator will play a very essential part in the automatic control of large processes for a long time to come. The human brain, as miraculous as it is, has some very serious drawbacks. It can store up and remember tremendous masses of information over long periods of time, but it can become confused very easily when it is required to translate this information into intelligent response at a very high speed. In this respect the machine is better. With the aid of modern electronic devices the machine can perform such operations as are within its capabilities at almost limitless speeds.

Man and machine . . . For the next decade the scope of the human operator will be extended. More and more attention will be paid to means for presenting to him the maximum amount of information in the most readily understandable and usable form. The ideal combination of man and machine will be the one in which the man will use his brain to analyze, form judgments, and initiate commands, while the machine takes over all of the information gathering and repetitive control operations where its inherent capabilities of speed and power are most effective.

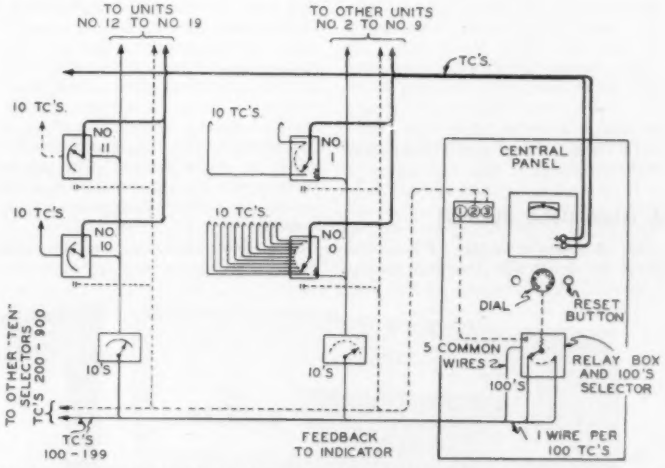
Process Monitoring

Most of the information gathered by the instruments associated with continuous processes is of no practical use to the operator, **except during periods of disturbance or actual danger.** The actual hour-by-hour, minute-to-minute control of even a very complex process under "normal" operations, involves the supervision of a relatively few significant variables. The automatic controllers and the inherent stability of the process keep the bulk of the quantities in proper relationship, **most of the time.**

Why monitor? . . . The function of a well-designed process monitoring system is to enable the operator to concentrate, in a relaxed manner, on the entire system during normal periods and to call his attention to any detailed abnormalities as soon as they are detected so that he can transfer his attention as needed to the part of the process being disturbed. In addition to this it may have secondary functions, such as data recording to form a basis for long-term research and study, cost accounting, etc., but its primary function is in its role of extending the scope of a single operator to ever larger and more continuous processes.



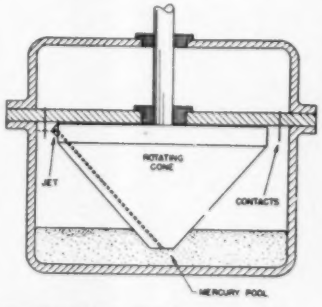
BASIC COMPONENTS of an automatic scanner. Main elements are one or more rotary stepping switches. Fig. 2.



DIALING-SYSTEM DIAGRAM shows hookup in which operator can dial directly and connect indicator to any one of a number of thermocouples. Fig. 3.

Four general methods for applying the principles of process monitoring to a modern plant are:

1. Graphic flow-sheet panel boards.
2. Annunciator systems.
3. Automatic scanning systems.
4. Automatic recording systems.



MERCURY-JET SWITCH is operated by a jet of mercury driven by a rotating cone. Mercury impinges on the contact points. Fig. 4.

1. Graphic Panel Boards

The development of miniature instruments and control stations has made it possible to crowd a great many instruments before a single operator. There is a limit to the amount of information to which an operator can react intelligently, particularly during upsets and times of stress. One practical solution, therefore, was to apply the techniques that had been developed in education, in the form of visual aids, to the design of the panel board so as to make the presentation as intelligible as possible. This has resulted in the development of the flow-sheet graphic

panel as a basic tool in central control-room design.

In a refinery employing continuous processing from one end of the system to the other it is possible for one man, standing before the graphic board, to watch the progress of a disturbance through the whole system and intelligently select corrective action which will bring the system back to equilibrium smoothly and without creating secondary upsets, such as might be caused by too sudden application of controls.

The graphic panel can be applied to a batch process such as two regenerative catalyst reactors which are reversed at regular intervals. The reversing cycle contains 88 steps in this process and is so complex and dangerous that extreme caution is required. In this case the panel is used for a different purpose, namely, to monitor every step of the process so that the operator can instantaneously detect any faulty operation or danger in the reversing cycle. As a result, this particular cycle is now reversed in a fraction of an hour whereas previously it had taken half a day or more.

2. Annunciator Systems

Fig. 1 shows a section of a control board for a complex chemical process in which the alarm system is used as an operating guide as well as a warning system. The panel board is a conventional type using standard pneumatic recorder controllers. The annunciators are located on the sloping panel at the top and each annunciator is located directly above the recorder controller to which it is related.

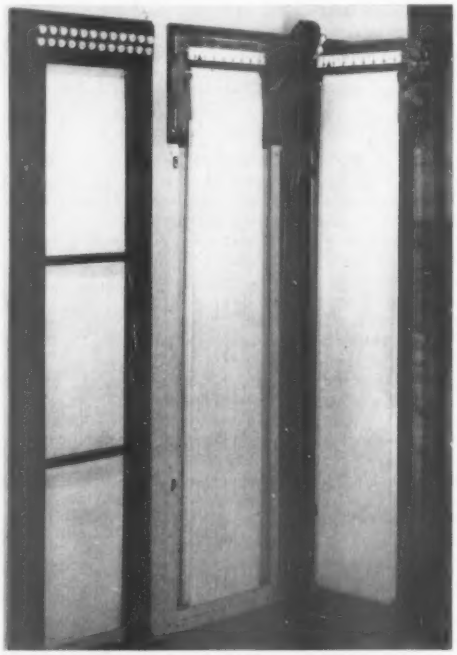
The annunciators are operated by pressure switches which are connected to the controller output pressure. Since this is a continuous process, the valve pressure normally remains within a rather narrow range and the pressure-switch settings are so arranged that the normal range of control pressure will not operate the alarm. As soon as the output pressure to any valve goes beyond the predetermined point, a buzzer is sounded and the operator is warned that there is an abnormal condition. This warning often comes before the actual measured variable goes off very much, particularly in the case of temperature, level, and some pressure controllers. A sticky valve or some fault in the controller itself will show up in this manner long before any trouble shows up in the process. The output pressure may change considerably even though the valve itself may not actually move.

A process monitored in this way leaves the operator free to watch the few critical points almost continuously. Any abnormality will sound the buzzer and call the operator's attention to the fact that something is not behaving in the normal manner. Of course, if real danger occurs, then a siren is sounded by a separate alarm system, or as may be noted on the right-hand panel of this group, a complete shutdown system protects the entire unit.

3. Automatic Scanning System

Basically an automatic scanner consists of components shown on Fig. 2. The main elements are one or more rotary stepping switches. For temperature scanners, two banks of contacts are necessary to switch the thermocouples, and at least one more bank for switching the position-indicating lights. Thermocouple circuits are connected to a pyrometer or a detector which has an adjustable alarm contact which actuates an annunciator system. Ordinarily, when one of the points exceeds its predetermined limits it actuates the annunciator. This energizes an alarm light and sounds a horn and at the same time stops the motor-driven pulser which drives the stepping switch. The operator then acknowledges this signal and notes the position of the scanner by its indicating lights. He

SCANNER WITH JACK PANEL for a large number of thermocouples equipped with a coordinate lighting system to show location of any point being scanned. Fig. 5.



SEGMENTAL RECORDER operates at two points per second using a ballistic printing mechanism. Unit records 576 points. Fig. 6.

then presses the reset switch which permits the scanner to proceed. Of course, there are many variations from this basic combination but essentially all scanners have these elements or their equivalents.

Commercial units . . . The first standard temperature monitor was developed by Leeds & Northrup Co. This unit monitors 160 temperatures in a manner somewhat similar to the unit described above. It has 8 banks, each containing 20 temperatures. In addition it is equipped with a strip-chart recorder which can print each point and has a numbering wheel to show the bank and number of each point as it is printed. If any point deviates beyond the high or low limits, an alarm is sounded through a standard annunciator system.

In recent years other standard scanning systems have become available, such as the Minneapolis-Honeywell 270-point temperature scanner and the Thomas A. Edison 25-point temperature scanner.

Sun oil system . . . An extremely flexible system was developed by Sun Oil Co. and extensively utilized in its Marcus Hook and Toledo plants. This system was described completely by E. J. Grace, Jr., at the September 1950 I.S.A. conference *(The Oil and Gas Journal, October 5, 1950, page 202).*

While this system uses a series of stepping switches somewhat like those described above, it has a number of elements which extend its usefulness considerably and make it very adaptable for many types of plant service.

Stepping switches . . . These are in a decade system so that the numbering system is a standard decimal arrangement. Ordinarily the system is made up with a master circuit capable of handling up to a thousand units with a separate stepping switch required for each 10 units.

Instead of the indicating lamps which are ordinarily used for registering the position of the scanner, two alternate types of index systems have been developed. One of these is a resistance network operated by the stepping switches, with three indicating millivoltmeters to show the position of the switches in hundreds, tens, and units.

Electric impulse . . . The other system uses an electric impulse, fed back from the stepping switch to a solenoid-actuated position indicator located at the panel. This latter system has several advantages in flexibility. The stepping switches do not have to be located on the main panel, and in fact are usually grouped in weatherproof boxes at the foot of the towers or near the equipment which they are monitoring. Therefore, the thermocouple lead wire need only be run to the individual stepping switches, and these switches connected to the main panel with a single cable consisting of five common wires and one extra wire for each 100 thermocouples, plus one pair of thermocouple leads. This affords a great saving in installation and lead wire in a large plant, but of course requires great care in weatherproofing the field-mounted stepping switches.

A second advantage lies in the ability to replace the motor-driven pulser with a standard telephone dialing mechanism (see Fig. 3). In this way the operator can dial directly and connect his instrument to any of the thermocouple points at will. Logging of temperatures is a very simple operation with this method. It is not necessary to redial each number, but merely by adding one pulse the system keeps progressing steadily ahead as fast as the operator can read it.

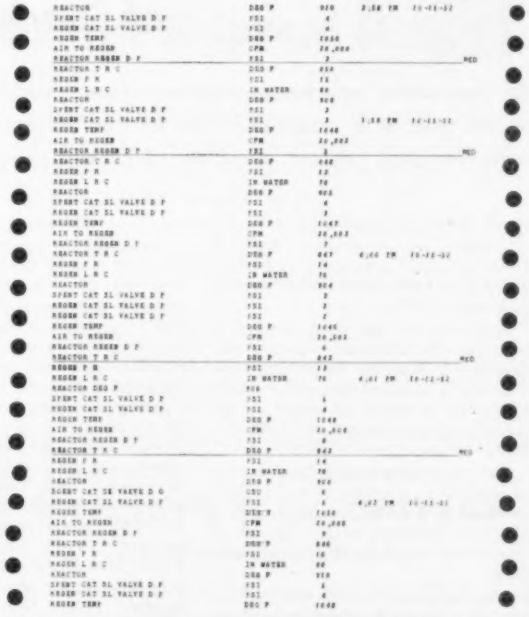
Stepping switches . . . For dialing systems these should be of the decade type although in larger scanning systems, for thousands of thermocouples, it may be more economical to use the 26-point multiple-bank switches. Either type of stepping switch can be obtained from the companies making standard telephone equipment.

While stepping switches have been used in self-interrupting telephone circuits at speeds up to 70 or 75 points per second, their use in scanning systems is generally limited to much less than this.

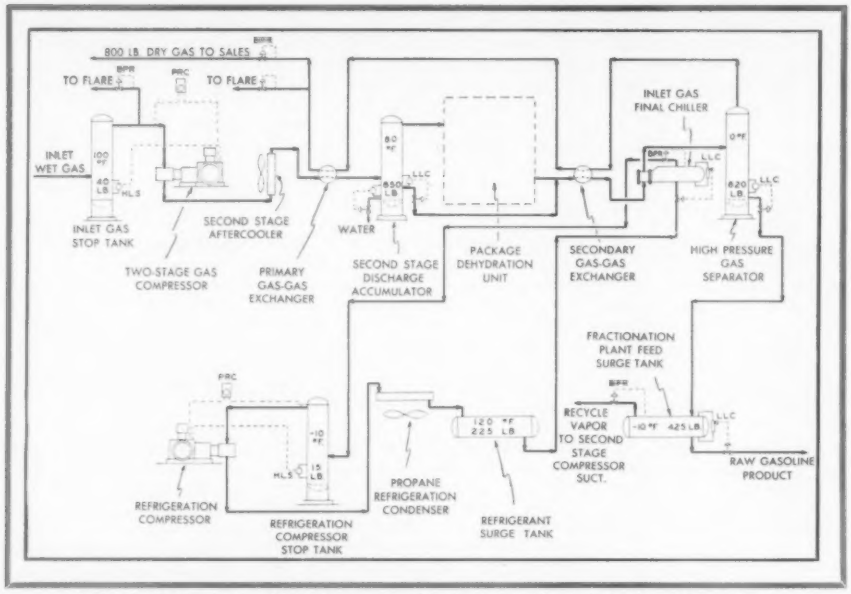
The main limitation on the speed at which the stepping switch can follow lies in the fact that at extremely high speeds, that is over 10 points per second, the noise level due to the switching and interferences may correspond to 5° or 10° unless the circuit is very carefully balanced for stray currents. By carefully balancing the circuits,

(Continued on page 135)

AUTOMATIC TYPEWRITER is electrically driven and can be completely operated by a five-channel digital converter. Fig. 7.



TYPICAL CHART made by the automatic typewriter which is operated from a scanner having the proper digital converter. Fig. 8.



TYPICAL FLOW in a refrigeration-type gasoline-plant extraction unit is shown here. Fig. 1.

INSTRUMENTATION . . .

of "packaged" gasoline plants

To understand any instrumentation system, some knowledge of the process is essential. Two entirely different processes here discussed present a variety of control problems

by T. D. Tabbert*

THE packaged gasoline plant is the answer to an industry need. It makes available processing equipment that can be used economically in small or lean-gas fields.

Requisites for the plant are that it be completely automatic, requiring only intermittent attention by an operator; it should be semiportable; and it should be flexible in design to permit its use for different gas analyses and field conditions.

The continuous flow instrumentation of small units is typical of any natural-gasoline plant, with only the quantity of safety shutdown devices instead of alarms varying from the conventional plant.

*Head of process division, Fish Engineering Corp. Presented at symposium on Instrumentation for the Process Industries, A. & M. College of Texas, 1953.

Extraction Unit

A typical refrigeration-type extraction unit flow is illustrated in Fig. 1. This type plant is ideal for low volumes of rich gas; that is, gas that is high in propane, butane, and gasoline content. Most of the low-pressure gas separated at 50 psi. and under can be classified as rich gas. The unit includes a package two-stage compressor to raise the gas pressure to a conventional sales pressure of 800 psi. The safety instrumentation to protect a gas engine for jacket-water temperature, lubricating-oil pressure, engine overspeed, and general failure is well known to instrument engineers in every field. To protect the engine from liquid carryover from the field separators, a small scrubber tank, equipped with a high-level shutdown, is employed.

In the event of compressor shutdown the safety heads on the field separators are protected by a single seated back-pressure regulator on the compressor suction line. A similar regulator for emergency relief is shown on the discharge of the plant which will allow the plant to continue in operation if the sales line is temporarily out of operation. The variations in field-gas volumes, caused by the varying productions of oil during the month, as well as from day to night, can be handled by a pressure controller in the suction line controlling the engine speed.

The increase in gas pressure and resultant cooling to atmospheric temperature causes some liquid dropout, but the use of a refrigeration system to lower the gas temperature to the 0° F. range greatly increases this liquid condensation. Dehydration of the gas is

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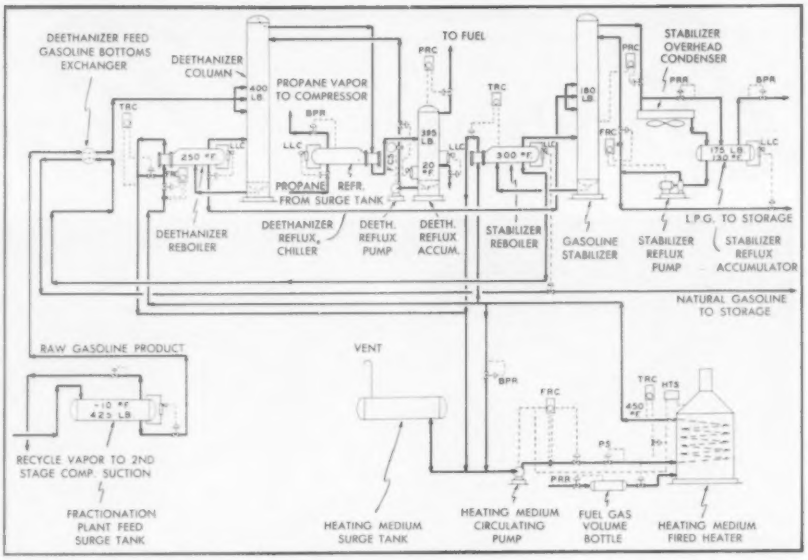
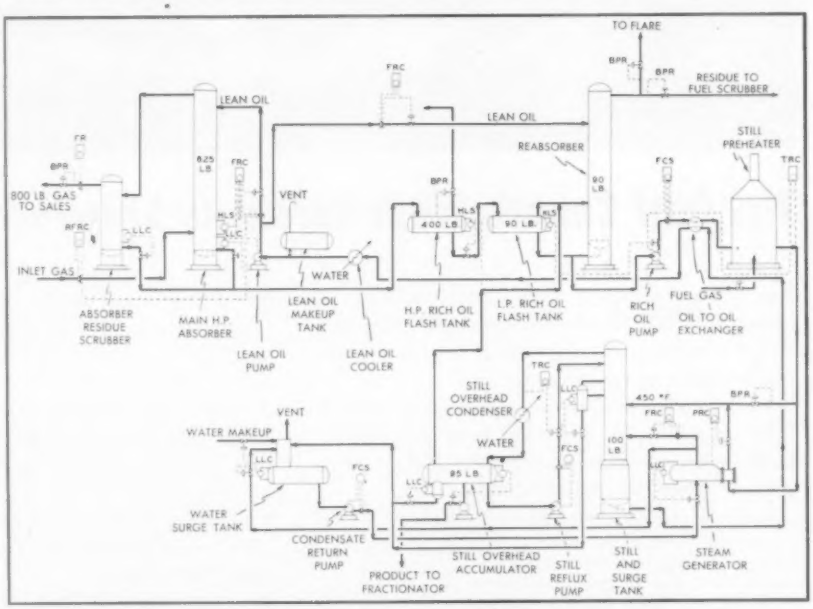
necessary to prevent hydrate formation and the water condensed by the primary cooling must be withdrawn by means of an interface level control from the compression gasoline before it is recombined with the dry gas.

An equilibrium separation of the liquid from the gas at high pressure and low temperatures results in a high-percentage recovery of propane and heavier constituents in the raw product; however, this raw liquid will also contain a high percentage of the undesirable methane and ethane components and fractionation is required. The withdrawal through the liquid-level control valve on the high-pressure separator, when the pressure is reduced to 425 psi., flashes some 10 to 20 per cent of the liquid to the gas phase. This gas, consisting largely of methane, is returned to the compressor's second stage suction for sale and is controlled by a back-pressure regulator. The semistable liquid remaining is the raw gasoline-plant product ready for fractionation.



TYPICAL AUTOMATIC FRACTIONATION unit used to separate the components in raw gasoline. Fig. 2.



PACKAGED ABSORPTION PLANT used for liquid hydrocarbon recovery from gas streams. Fig. 3.

Refrigeration unit . . . The refrigeration unit can be added to the main compressor provided sufficient compressor throws are available. Propane is the refrigerant in this case. The gas temperature can be controlled by controlling pressure at which the propane evaporates in the kettle-type chiller. Slight variations due to change in gas load will cause some variation in final gas temperature but will not justify more elaborate temperature controls.

A typical automatic fractionation unit consisting of two columns is used to fractionate the raw gasoline. A deethanizer is used to remove methane and ethane as the overhead vapor, and a stabilizer is used to produce specification natural gasoline as the bottom product and resulting butane and propane mix as the overhead product. The fractionation plant feed surge tank is equipped with a long-range level control set to a wide proportional band to minimize changes in plant production. This unit is shown in Fig. 2.

Column instrumentation . . . The deethanizer instrumentatiton is arranged to put a constant heat input into the reboiler by maintaining a constant flow of heating medium and controlling the

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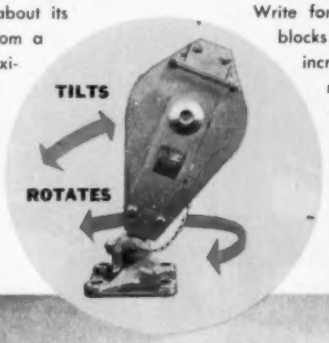

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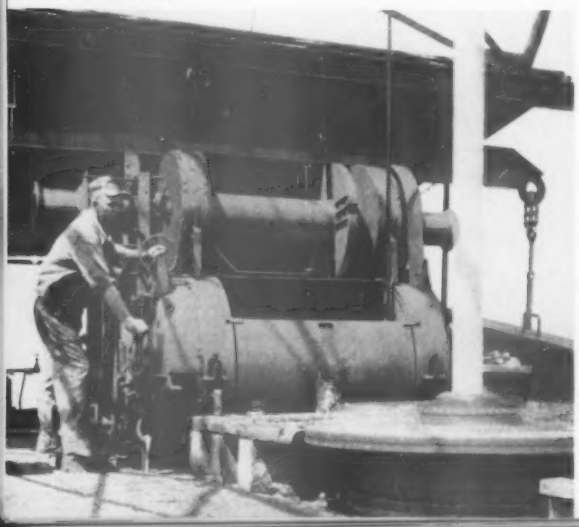

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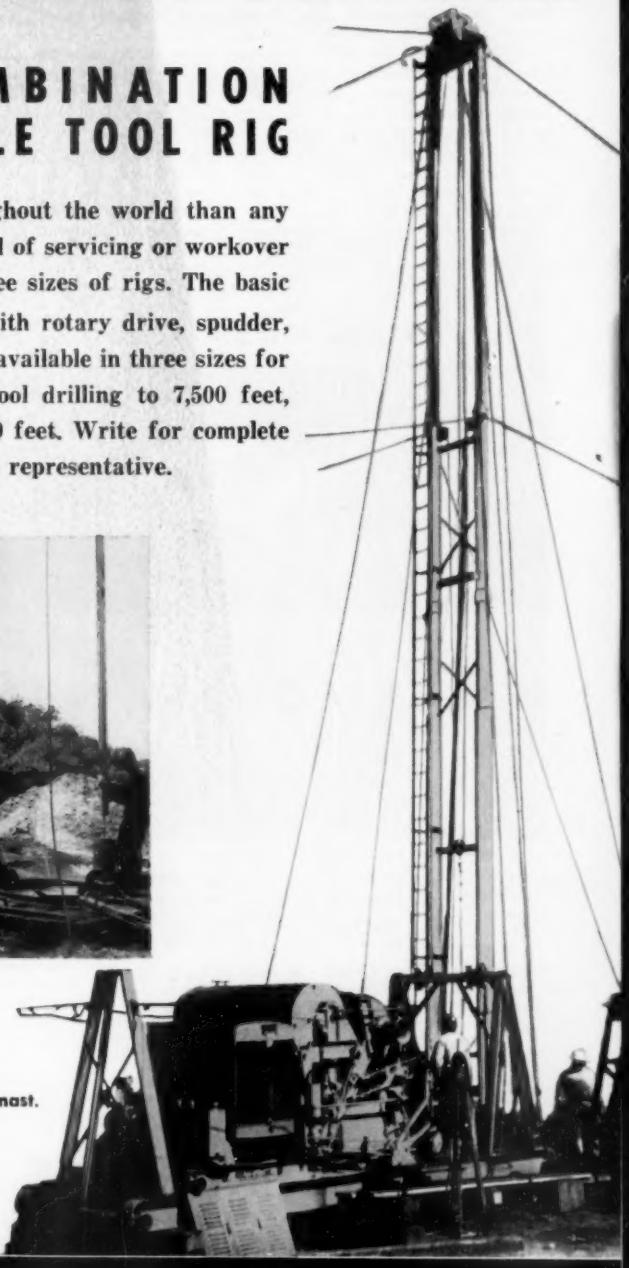

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temperature of this heating medium in and out of the reboiler. Sufficient heat must be introduced into the kettle to strip the bottoms completely of methane and substantially all of the ethane. All of the overhead product that condenses in the reflux accumulator is pumped back to the column to minimize the propane loss. A small amount of propane loss in the overhead is necessary to obtain reflux even at the refrigeration temperature shown, and this system of control allows the overhead product to be removed as a vapor and used as plant fuel.

The deethanized bottom product is pressured directly to the stabilizer, where the bottom temperature and pressure are maintained constant to produce 14 to 26-lb. R.v.p. gasoline. In this case a constant flow of controlled reflux is employed. An air cooler has been employed as the reflux condenser to completely eliminate the use of water. Total condensation of the overhead will be obtained even with air cooling. It is advisable to provide a simple pressure - reducing regulator bypass around this unit to prevent pressure variations in the pump suction pressure with changes in atmospheric conditions. The back - pressure regulator on the overhead is for emergency use only.

The heating-oil furnace is the direct-fire type and requires the most extensive safety precautions due to its hazardous duty. The outlet temperature controller directly controlling the fuel-gas supply is perfectly satisfactory for this service. In the event of a tube failure a simple check valve prevents the back flow of oil and the drop in pressure causes the pressure valve in the inlet line to close. To prevent overfiring of the heater a high-temperature cutoff is installed in the furnace stack. The flow - recorder controller is equipped with a low-flow cutoff to shut down the pump and close the fuel supply to the burner. A simple pilot safety switch to lock the fuel valve in the event of flame failure completes the instrumentation of the heater.

Complete Operating Unit

This fractionation unit, in combination with the compression plant described previously, is a complete operating unit. The basic simplicity of the plant, with only three operating pumps, a propane refrigeration unit, and two electric - driven fans for the cooling services, makes the plant shutdown very easy. Using a common electric shutdown system, the failure of any one of the six moving items to perform its duty can be used to shut down the entire liquid extraction and fractionation unit. This will not prevent the gas-compressor unit from operating with its individual coolers and gas sales can continue uninterrupted.

The packaging of an absorption plant for liquid hydrocarbon recovery is a more common application and one which is ideally suited for complete automatic control. The process flow shown in Fig. 3 is one of innumerable possible flows to obtain a relatively high percentage of L.P.G. and natural gasoline from a relatively lean gas. Most of the Gulf Coast distillate fields are examples of this type gas, where field separation at 800 psi. and over is employed. Many small fields with potential volumes of 5 to 25 million cubic feet per day are now shut in or are selling untreated gas to the transmission systems. While this is a loss to the producer and the country of valuable liquid hydrocarbons, it is also a major operating problem to the pipe line, since the heavy gasoline dropout reduces the carrying capacity of the line.

A ratio flow control setup is employed to maintain the lean-oil rate in proportion to the incoming gas rate, largely for fuel savings. A certain minimum oil rate must be maintained to insure proper operation of the heater during light gas-load conditions. The high-pressure oil pump which is the

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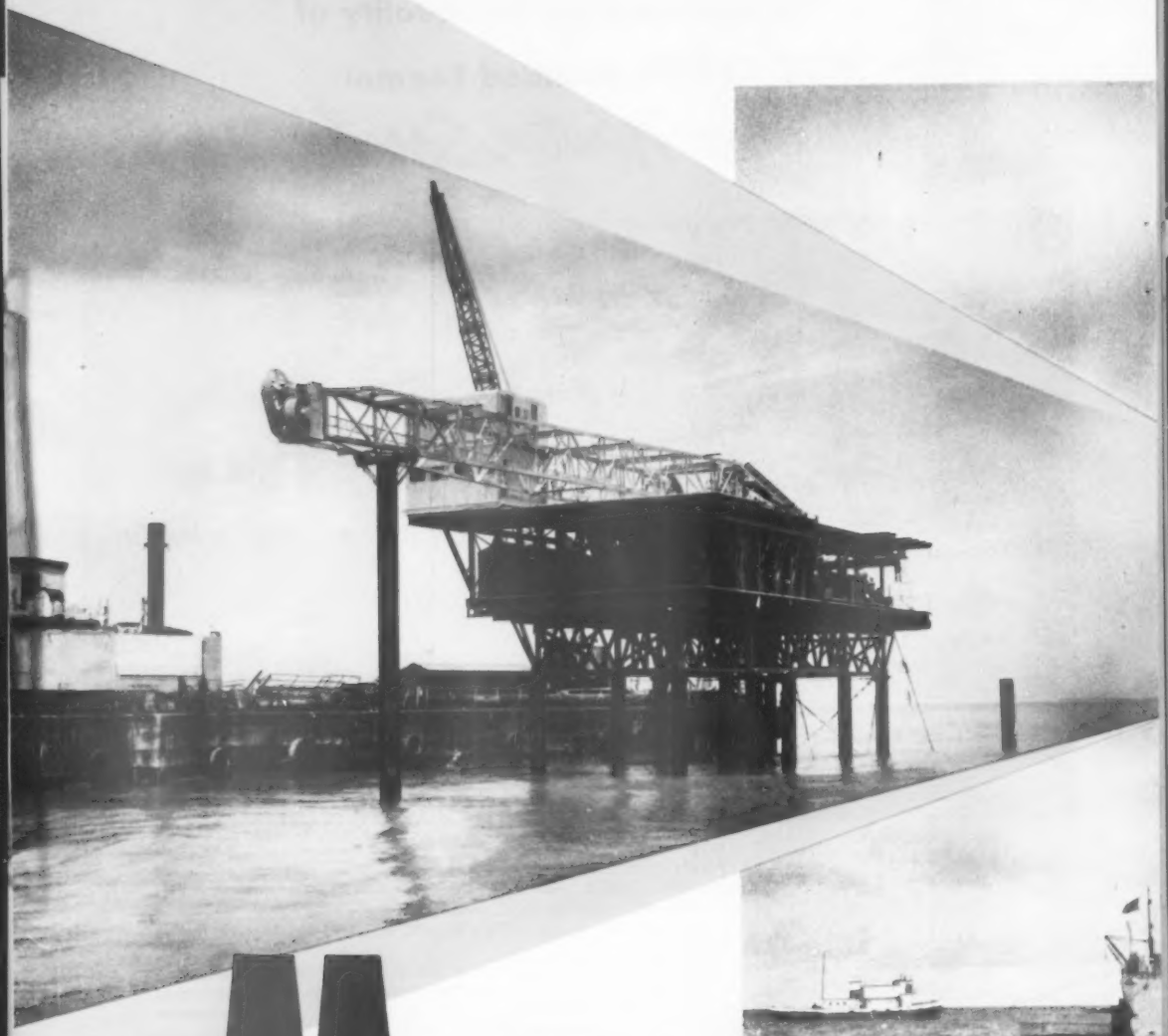

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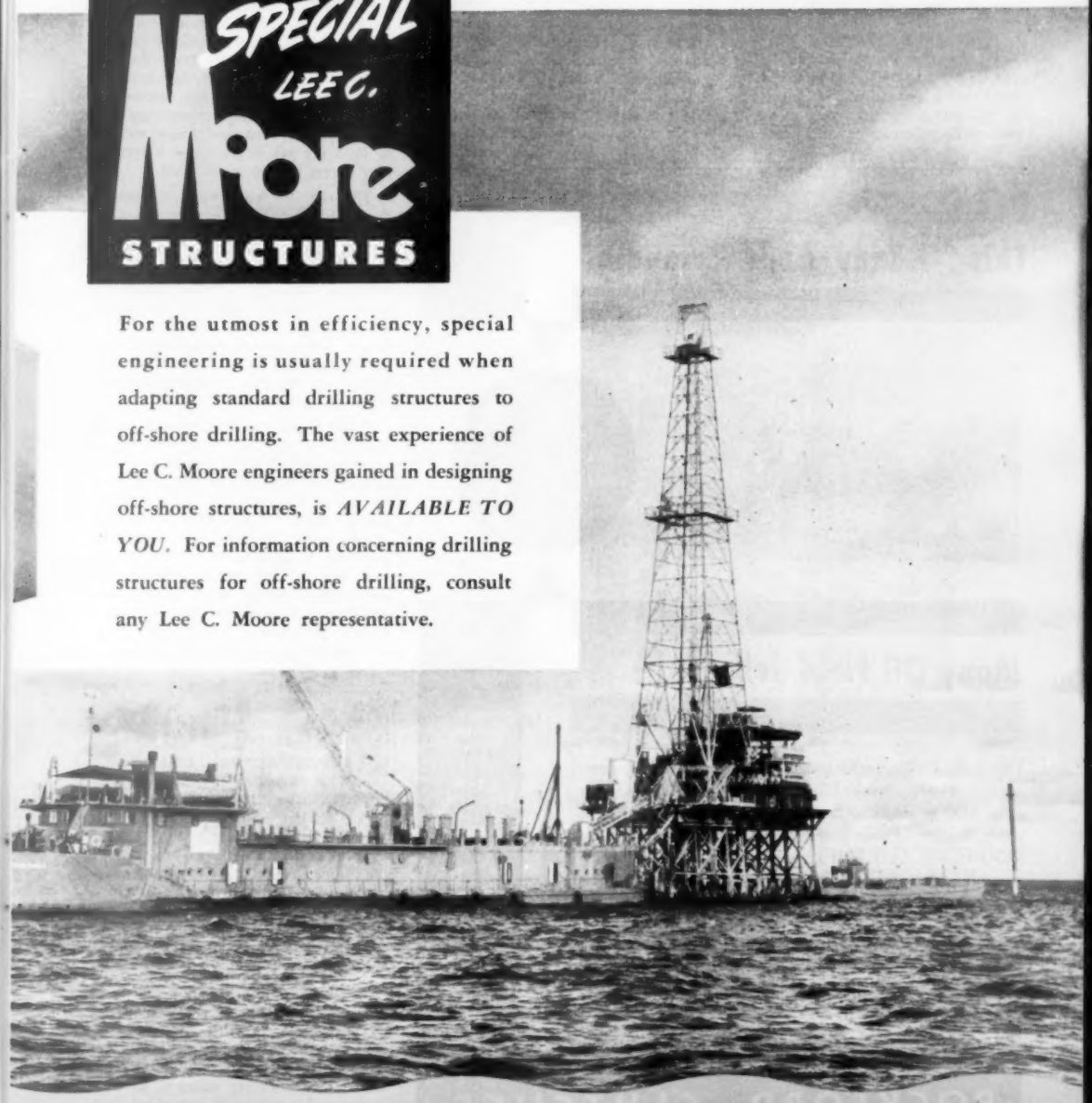

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critical item of moving equipment in the plant will be shut down automatically for low flow. In the event a plant holdup in oil circulation causes the oil to build up in the base of the absorber, a separate high level shutdown is employed to stop the oil circulation completely, though the gas flow to dehydration and sales can continue uninterrupted.

Oil-gas separation . . . The rich oil in equilibrium at the absorber bottom conditions is flashed in two stages, at 400 psi. and 90 psi., to vent as vapor substantial quantities of methane and ethane. Both of these flash tanks are protected by oversizing the relief valves for the capacity of the liquid level control preceding it. Similarly the level controls are each equipped with a high-level shutdown to prevent oil buildup and loss by shutting down the preceding level-control valves. Little difficulty is experienced with simple reduction in pressure but adequate provision must be made for each level-control valve sticking open or closed.

The gas from the high-pressure flash tank will be largely methane and if not used for fuel it will be returned to the sales lines by means of a small recompressor. The gas from the low-pressure flash tank is retreated in a small reabsorber to recover the product loss. Any reabsorber serves an identical purpose as the absorber to concentrate the desired heavy constituents in the oil stream. Since the low-pressure flash tank and the reabsorber operate at the same pressure, the two vessels are equalized and a common level control and back-pressure regulator can be used. The residue gas from the reabsorber is the fuel supply and makeup will ordinarily be required. However, an emergency back-pressure regulator can be provided on this residue stream to flare the gas in the event a temporary excess of fuel is available.

The rich oil from the low-pressure flash tank and the reabsorber has now been stabilized by removing the major portion of the methane and some of the ethane picked up in the high-pressure absorber. This combined stream is pumped through the oil-to-oil exchanger and a direct-fired preheater where the temperature of the oil is increased to a point where the majority of the light ends separate into the vapor phase.

Some of the heavy gasoline fraction remains in the oil, however, and a small quantity of stripping steam is required to completely strip the lean oil before it is returned to the lean-oil pump. Rather than install a separate steam boiler requiring an operator's presence, a small kettle-type shell-and-tube unit is employed to generate the necessary stripping steam. By adding this heat load to the direct-fired heater, a single heat source is employed, greatly simplifying operating difficulties.

Heater control . . . The control of the heater is similar to that of the fractionation unit. The stripping steam to the still is flow controlled with the pressure maintained constant by a pressure controller regulating the quantity of hot oil and vapor passing through the tubes of the kettle-type boiler. By providing surge space in the base of the still or in an adjacent tank, all of the fluctuations in oil flow can be overcome. No level control for the return oil is required, and in the event oil level is completely lost, the main oil pump would shut down on loss of suction.

In flashing and stripping the dissolved constituents from the lean oil, a considerable quantity of absorption oil enters the vapor phase. Therefore, the top section of the still is operated as any fractionating column, to condense and return any vaporized lean oil and allow the gasoline to pass overhead as vapor. A simple temperature control for the column-top temperature

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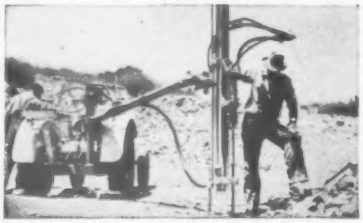

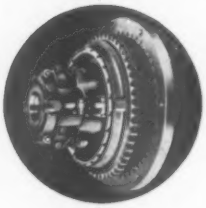

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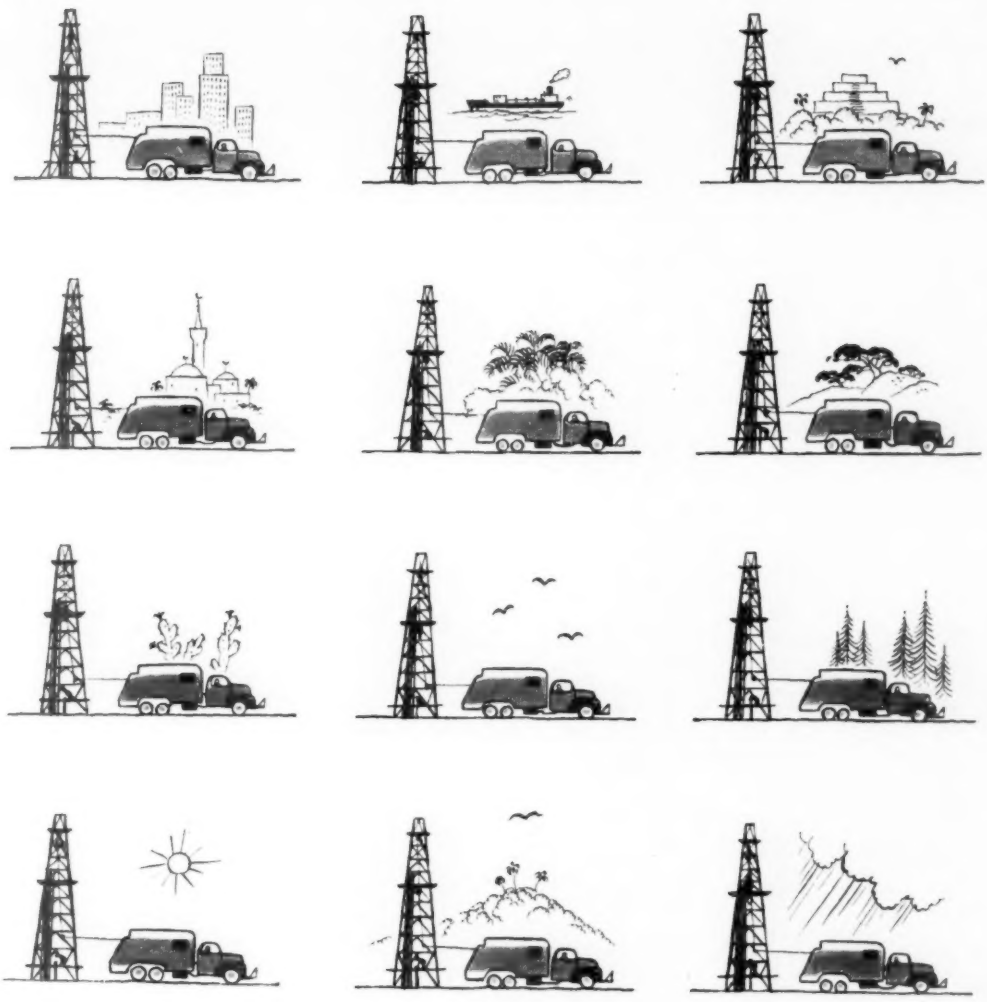

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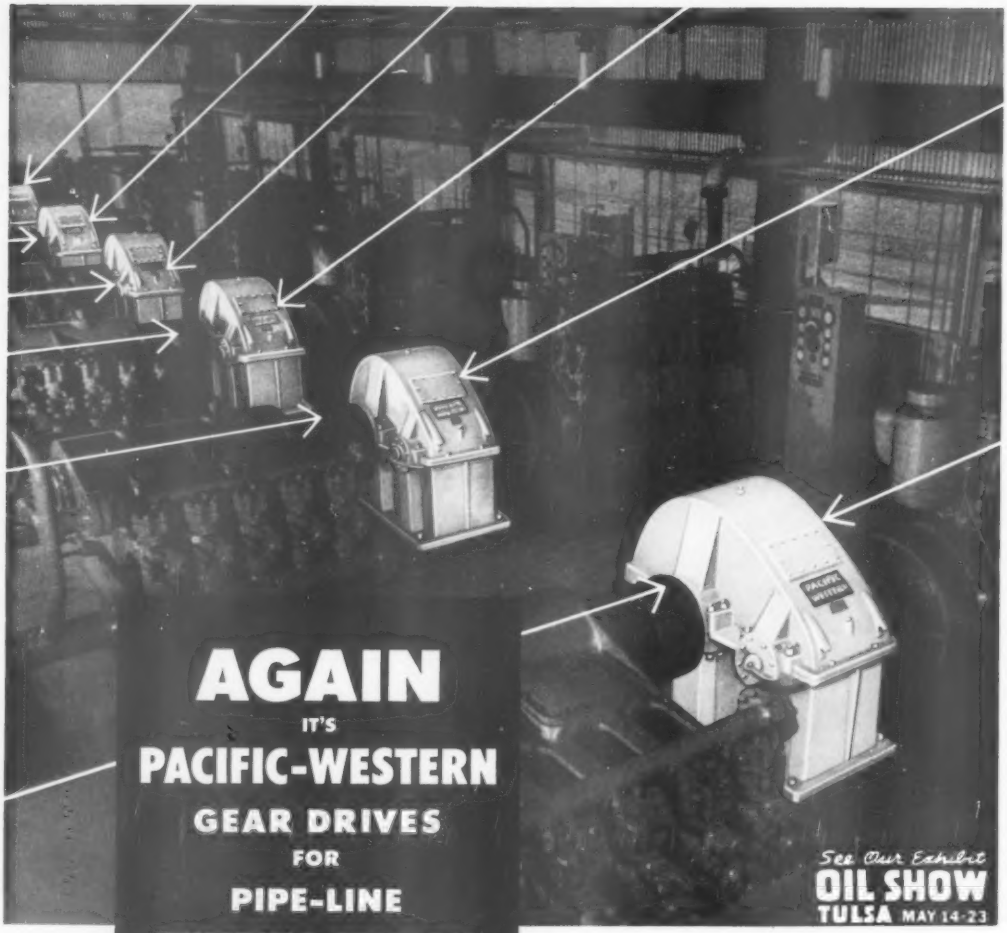

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regulates the reflux rate sufficiently to make this separation. The overhead product is cooled by water with a high percentage entering the liquid phase which is the raw plant product for fractionation either here or at a control plant. Vapor in equilibrium with the product contains considerable valuable components which are recycled to the reabsorber for recovery.

Part of the stripping steam used in the still is condensed in the fractionation section of the column and is withdrawn by an interface level control midway up in the fractionation section. The remainder is condensed overhead and is similarly recovered from a bootleg on the overhead accumulator. All of the water is returned to an atmospheric deareating column where the carbon dioxide concentrated from the inlet gas is removed with a small bleed stream of steam.

Shutdown system . . . A central shutdown system for this absorption plant can be employed similarly to that discussed for the compression refrigeration plant. The rich oil, lean oil, and still reflux pumps, which are essential for successful operation, can be connected to a common shutdown system. Then the failure of any one will completely stop the plant. It would not be necessary to shut down the plant in the event of the failure of the steam system; for, while a lower extraction efficiency would result, no stoppage of oil or gas flow would be necessary.

Water cooling is used for this flow since most of the high-pressure distillate fields are located in an area of plentiful water. While the use of air cooling would enlarge the plant size slightly, it could also be adopted to an automatic unit. Whatever utility is used for cooling, it will also have to be tied into the plant shutdown system.

Unit construction . . . A packaged-type distillation unit for an absorption plant was redesigned from a similar existing plant to study the advantages and disadvantages of skid-mounting an entire gasoline plant. This is a highly efficient unit to recover over 50 per cent of the propane content of the inlet gas and somewhat larger than our present projected plants. It does, however, contain a number of features that are typical of any package unit.

Separate Skids Used

Separate skids of 8-ft. maximum width are employed for this unit, which can be transported easily and interlocked in the field to make it an integral unit. Only the columns and interconnecting piping require field crews for completing the installation. These units can be shop fabricated and assembled with minimum piping runs plus the simplest possible foundation slab, thus lowering the initial investment. It is also an ideal unit to be relocated, with near 100 per cent salvage value when the field has depleted to a point to make the operation unprofitable.

In combination with this unit, two similar single-skid units were developed; one to handle the absorber with its scrubbers and lean oil pump, the other to handle the two-column fractionation unit. This was done largely for flexibility, as well as to spread the unit for safety and accessibility. However, the plant could operate over a wide variety of field conditions, with no change in any equipment.

For example, a plant designed for a large volume of high-pressure lean gas would handle a small volume of low-pressure rich gas equally well. Initial layout was made for gas volumes from 40,000 to 5,000,000 cu. ft. per day with a wide variety of liquid contents. With the exception of the absorbers, all of the equipment sizing can be based on the oil-circulation rate. By basing all of the design on oil rate, packaged plants could be developed for 50 g.p.m., 100 g.p.m., etc., with the selection governed by the volume, pressure, and content of the inlet gas.

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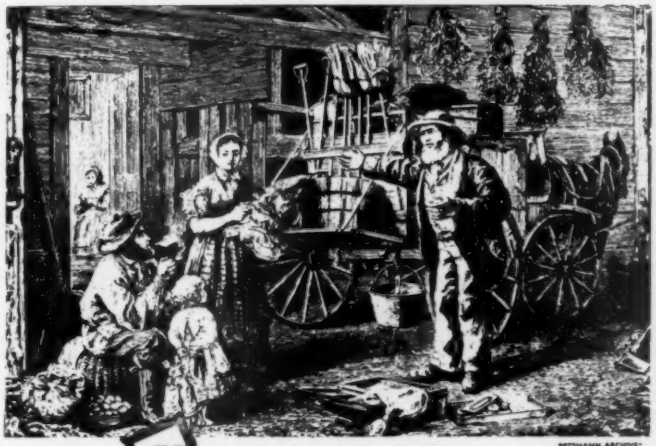

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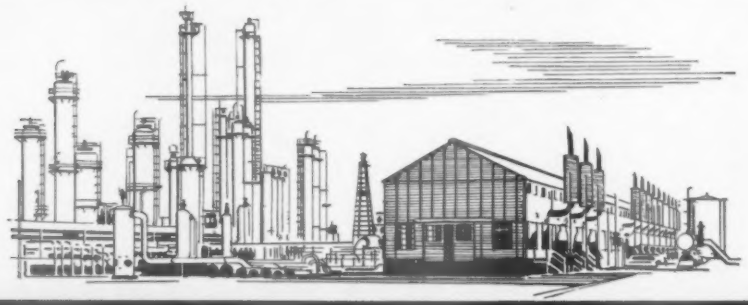
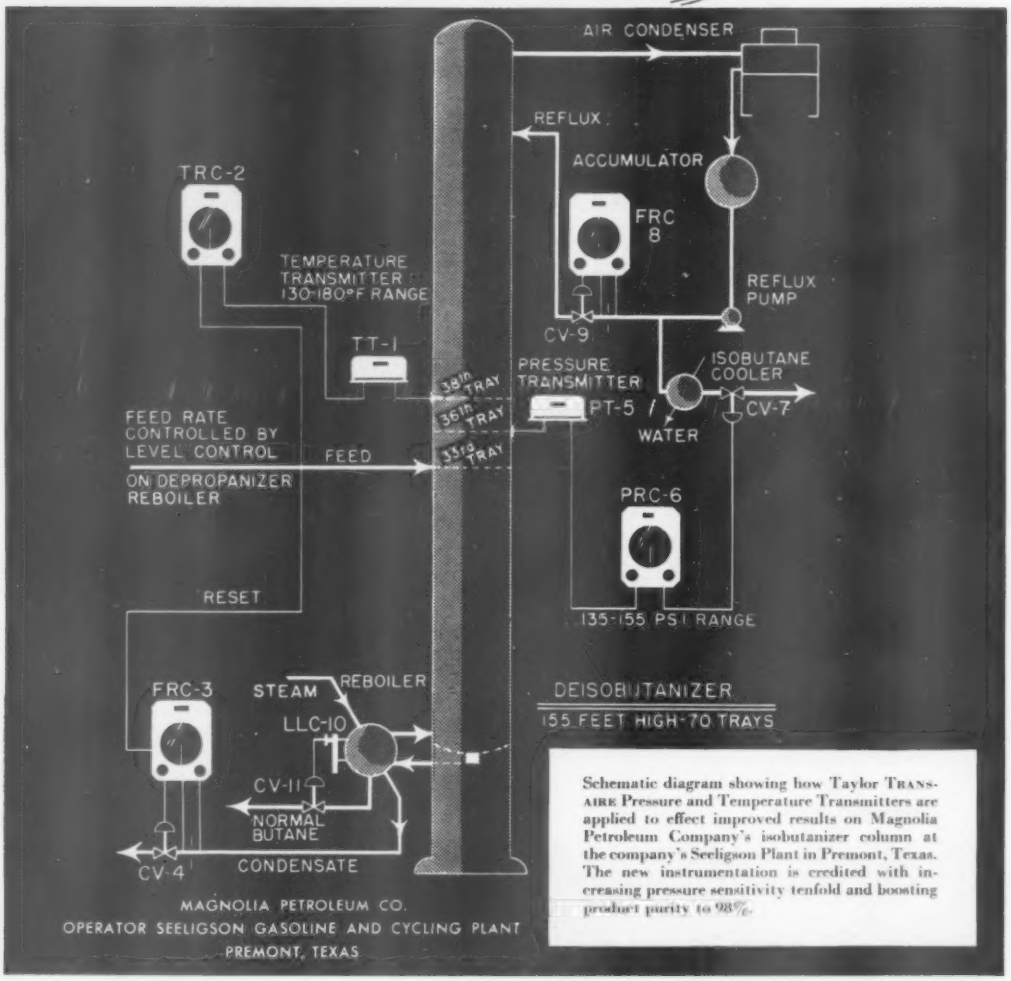
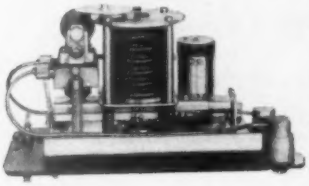




Schematic diagram showing how Taylor TRANSAIRE Pressure and Temperature Transmitters are applied to effect improved results on Magnolia Petroleum Company's isobutanizer column at the company's Seeligson Plant in Premont, Texas. The new instrumentation is credited with increasing pressure sensitivity tenfold and boosting product purity to 98%.

ISOBUTANE 98%+ PURE

THE Seeligson Plant, at Premont, Texas, a part-interest project operated by Magnolia Petroleum Company, has raised its isobutane purity from approximately 95% to consistently better than 98%. Manual adjustment of control instruments is a thing of the past. And purity tests are now made once during each 8 hour shift instead of at 2 hour intervals.

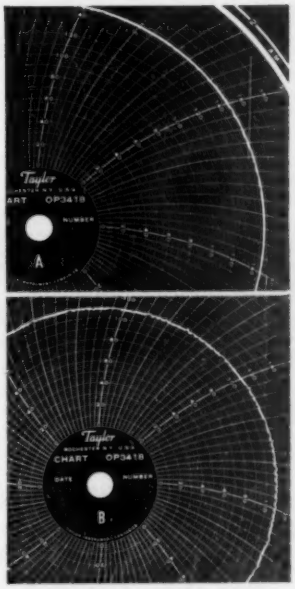


These very real benefits are traceable to the installation of Taylor TRANSAIRE* suppressed range temperature and pressure transmitters as measuring elements on the deisobutanizer column. Illustrated at left is present Seeligson Plant deisobutanizer instrumentation.

The temperature controller (TRC-2) used to be actuated by a conventional thermal system with a 0° to 200°F. range. Now the TRANSAIRE Temperature Transmitter (TT-1), with SPEED-ACT* (rate response in the measuring system) actuates this controller, operating with a range of 130° to 180°F. Thus sensitivity of temperature measurement has been increased two ways. Where a 200°F. change previously gave full scale deflection of the pen now a 50°F. change does the same thing. Well lag is fully compensated by SPEED-ACT rate action response in the measuring circuit.

The pressure controller (PRC-6) originally had a range of 0 to 200 psig. Now with the suppressed range TRANSAIRE Pressure Transmitter (PT-5) the range span is 20 psi, for 135 to 155 psig. With the conventional pressure system 1% of the controller chart range represented 2 psi pressure change. Now 1% of the chart represents 0.2 psi change, resulting in a tenfold increase in sensitivity of pressure measurement, as shown by charts at right.

Magnolia's use of Taylor TRANSAIRE transmitters is an excellent example of how these highly sensitive and accurate instruments permit better process control, effect operating economies and insure a consistently high quality product.



Comparative charts reflect the greater sensitivity of the new measuring system after Magnolia installed a TRANSAIRE Pressure Transmitter. Illustration A is a portion of an old chart when the measuring element had a 200 psi range span. Illustration B is a portion of a recent chart whose measuring element, a Taylor TRANSAIRE Transmitter, has a range span of only 20 psi. Each scale unit of the first chart equals 1.0 psi pressure change, each unit of the second only 0.1 psi.

For complete information on Taylor measuring, transmitting, controlling and recording systems for the petroleum industry, call in your Taylor Field Engineer, or write Taylor Instrument Companies, Rochester, N.Y., and Toronto, Canada.

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TRAILER-MOUNTED WORKOVER RIG of C-B Drilling Co. is seen here on its first location, J. R. Butler Co.'s 3 Gulf Fee, Blue Ridge field, Harris County, Texas.

A-FRAME on substructure trailer is used for raising and lowering mast. Once mast is telescoped and laid down, A-frame is lowered to rest on top of mast during movement of rig.

New Trailer-Mounted Workover Rig . . .

Unit can be rigged up or torn down in 3½-4 hours. In moving, four loads are involved: (1) and (2) trailers, (3) mud pumps and generator, and (4) swivel, kelly, stair steps, pipe rack, A-frames, and miscellaneous.

by F. Lawrence Resen
Gulf Coast District Editor

DRAW-WORKS TRAILER is used to support draw works, engine, driller's controls, and doghouse. Mast marks the beginning of the substructure trailer.

A TRAILER-MOUNTED workover rig, with a telescoping mast and compact features, is used by C-B Drilling Co., Houston, to perform speedy workover jobs.

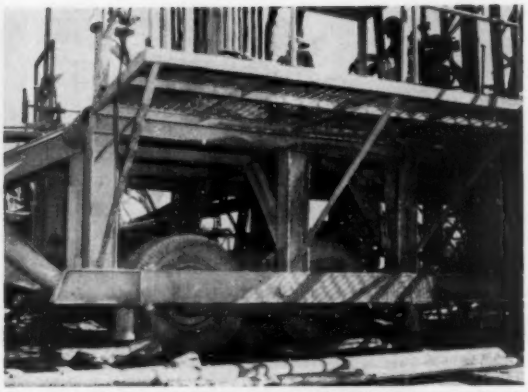
With two trailers used to support mast and draw works as well as transport them, the unit boasts of a high degree of mobility as well as a short rigging-up and tearing-down time.

Incorporating many built-in features which contribute to its efficiency, the rig is capable of being rigged up or torn down in 3½-4 hours under average conditions.

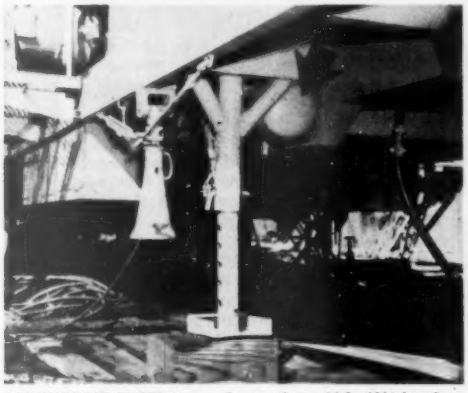
Its general design utilizes one substructure trailer upon which is located rotary table, telescoping mast, and A-frame. A second trailer is used for supporting draw works, draw-works engine, driller's controls, doghouse, air pump, and air volume tanks. Two mud pumps and electric generator are transported separately.

Substructure trailer . . . The derrick, A-frame, and rotary table are mounted on the forward, or substructure, trailer. The main section of the substructure trailer has a platform 10 ft. wide and 21½ ft. long. Forward of this is a narrow section, 5 ft. wide and 17 ft. long,

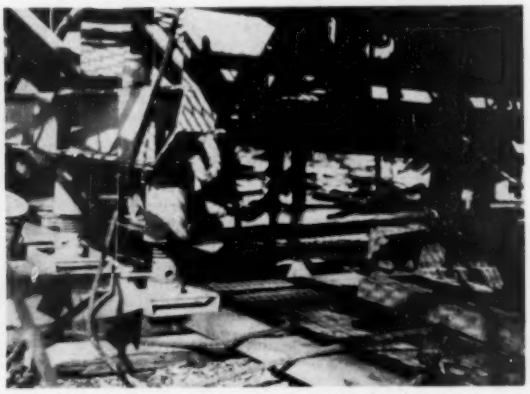
DRILLER'S CONTROL STATION on draw-works platform. Blowout preventer is actuated by controls (arrowed) a few steps away and located beneath A-frame on substructure.



SUBSTRUCTURE TRAILER has four sets of dual wheels supporting it during transit. Catwalk which is supported by lengths of pipe pivoted under walk is collapsed alongside of structure during movements.



AIR VOLUME TANK (arrowed) one of two 14-ft. 10¾-in. pipes, is seen suspended from floor of draw-works trailer. Other tank is in a similar position on other side of trailer.



BUILT-IN JACKS (arrowed) used to support the rig substructure rest on bosses to prevent their sinking into wooden planks. Note turnbuckle in center of picture used for securing the two trailers.

to which is attached the pipe rack. This section is also used to cradle the telescoped mast when changing locations. A 20-ft. extension is attached to the narrow runway for use in laying down pipe.

Catwalks, 3 ft. wide, extend along the sides of the platform portion of the substructure while on location. These are supported by lengths of pipe, which are pivoted to the bottom of the catwalks along the outside edge and angle downward to the substructure where they slip over dogs, welded to the beams for this purpose. The entire catwalk is hinged, so that when moving the trailer, the supporting pipe sections are lifted off of the dogs, and the catwalk swings down alongside the trailer.

Dual wheels . . . When in transit the trailer is supported by four sets of dual wheels mounted below the forward end of the drilling platform. These wheels are mounted within the substructure and are mounted on stub axles so that wheels may be changed from within. The axles are secured to a 3-in.-wide steel swaybar which is 52 in. long and pinned to a structural beam by a 5-in. diameter steel pin. The pin is threaded at one end and a large nut is used to hold the swaybar securely on the pin.

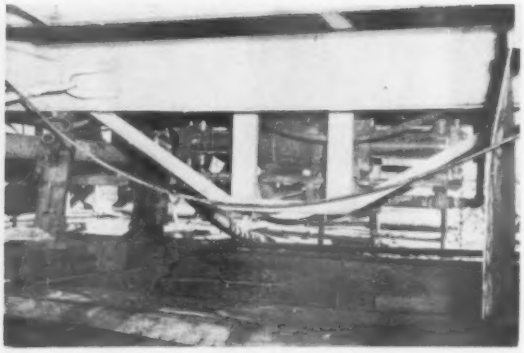
The substructure trailer is backed over a well when moving on location, and to provide for clearance, removable sections have been incorporated in its design. A bar, pinned across the bottom of the substructure, rear, is removed as well as a beam and centerline vertical brace located at the second stanchion, when moving over a well. The vertical clearance of the substructure is 5 ft. 10 in. to provide for passing over christmas trees.

Hinged jacks . . . Once the trailer has been backed into position over a well, the removable beam and braces are replaced and jacks are used for relieving the weight on the wheels. The jacks are hinged to the lower beams of the substructure and swing upward where they are pinned while trailer is being moved. Jack bosses, which are hung on dogs welded to the beams when not in use, are placed under the screw-type jacks and they are adjusted until the substructure achieves its desired position.

Meanwhile, the forward section of the mast has also been jacked up and later, after the mast has been raised and power connected, the cat line will be used to lift the front-end extension into position. The forward runway has two jacks mounted on long arms in one unit, which like the other jacks, swings upward on hinges when the unit is being moved.

Pipe rack . . . The pipe rack is unique in that, while one end is supported on regular A-frame, the other end makes

PIPE RACK uses built-in receptacles (arrowed) on runway for supporting I-beams at one end. A pipe-rack A-frame is used to support them when extended perpendicularly from runway.



HIGH-PRESSURE AIR PUMP is suspended beneath forward end of draw-works trailer and supplies air for operating purposes as well as for blowout preventer.

up into the forward runway and thereby receives support. This is accomplished through the use of I-beams which are notched at one end and fit into receptacles which are welded onto the outside beams of the runway.

These receptacles consist merely of two short pieces of angle iron welded vertically and a short distance apart so that a 1½-in. vertical slot is formed; the bottom of the receptacle is formed by a rectangular piece of plate steel, which is welded to the angle irons and runway beam. The top of the boxlike receptacle is open, and by use of the catline, the slotted end of each I-beam may be placed in its respective receptacle and extend perpendicularly from the runway to the supporting A-frame. A similar arrangement is made on both sides of the runway to provide for setting up the pipe rack on either side of the substructure, depending on the individual well location.

A cradle has been made for the pipe-rack beams, which allows them to be conveniently stored while the rig is being moved. This cradle consists of merely a small I-beam extending a few feet outward from the side of the runway, upon which one end of the beams rest, with their other ends being supported by one of the main beams of the substructure. The small I-beam has a metal plate welded at its outboard end to keep the beams from sliding off. When in transit, the three pipe-rack beams lie parallel to each other, immediately adjacent to the runway, but extend downward in an angular fashion to the supporting substructure beam.

Draw-works trailer . . . The second trailer making up the unit is used to carry the draw works, driller's controls, draw-works engine, and doghouse. In addition, located under the trailer floor are two air-volume tanks for storing air used in operating clutches, as well as the blowout preventer. A high-pressure air pump is also located below the floor at the forward end of the trailer.

In rigging up the unit, the draw-works trailer is pulled in behind the substructure, already on the well and tied to it by use of turnbuckles. Using jacks built into its body, the draw-works trailer is raised and leveled. Design specifications call for it to be in one definite position in relation to the substructure.

Length of the draw-works trailer is 37 ft., width is 8 ft. The doghouse occupies the rear portion of the trailer, while immediately forward is the draw-works engine which has water-spray silencer on its exhaust for safe working conditions around high gas pressures. Power takeoff from the engine and the draw works is located in the remaining forward section of the trailer. The driller's controls are located to the right of the draw works and are on a lower level than the actual derrick floor.

Air supply . . . Running lengthwise under the trailer floor are two air volume tanks which are situated parallel to each other. These are constructed from 10¾-in. o.d. pipe and each is 14 ft. in length.

The high-pressure air pump is permanently installed just forward of the two tanks. Output of this unit is 125 psi. compressed air, which when applied to the blowout preventer is capable of setting 5,000 lb. of hydraulic pressure in 15 seconds.

The blowout preventer is operated by the driller from his station on the draw-works trailer. Controls to the air supply are located beneath the control console and the levers actuating the blowout preventer itself are located beneath the A-frame on the substructure trailer. Once the driller has opened valves for air system, he has merely to walk forward a few steps to reach the control levers for the preventers. Hoses running from air supply to the blowout preventer when the well is on location are made up with knockup unions, for quick assembly and tear down.

Cathead removal . . . An interesting feature is the cathead assembly on the driller's side of the draw works. When assembled on location, the cathead extends out over the trailer body, which is quite satisfactory except while in transit over highways. Consequently, when moving the rig it is necessary to dismantle the cathead.

To streamline this procedure, a special supporting I-beam has been mounted over the draw works. One end of this is pivoted so that the beam may be swung in an arc. A trolley has been constructed from a U-shaped piece of heavy steel strap, similar to a shackle, which has its open end closed over a bolt, which is allowed to roll freely along the upper side of the I-beam. The lower end of the U-bar is secured to the cathead housing by means of a threaded bar, which may be adjusted to insure that the cathead is in proper position each time it is assembled.

When it is necessary to move the rig, the bolts on the clutch plate of the cathead are removed and the cathead assembly, supported on the pivoted I-beam, may be swung in towards the center of the trailer. At the same time it may be rolled to a convenient position on the I-beam and secured while in transit. The reverse procedure is followed in rigging up and eliminates the need for lifting the heavy assembly with a catline each time the unit has to be moved.

Derrick . . . The mast has a clearance of 103 ft. from the bottom of the crown block to ground level. Clearance from

(Continued on page 139)

AUTOCARS

This Model C-70-64S Autocar, owned by Wamix, Inc., Dallas, Tex., is not the biggest Autocar made, but is plenty big enough to handle the mixer holding 6 cubic yards of concrete. The dual drive axle enables it to go anywhere, road or no road.

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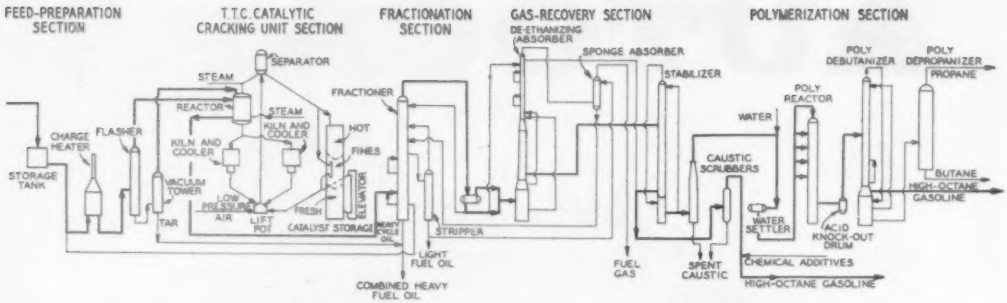


Fig. 1—Flow chart for Vickers Petroleum Co.'s new Socony-T.C.C. unit at Potwin, Kans.

Vickers Petroleum Ups Throughput With New Package T.C.C. Unit

Costs cut by shop fabrication, standardization, and the derrick structure for catalytic section

DAILY throughput of the Vickers Petroleum Co. refinery at Potwin, Kans., has been increased to 12,000 bbl. per day with installation of new facilities including a "package" T.C.C. unit.

The new T.C.C. package unit has been engineered for the smaller refinery charging in the range of 12,000 bbl. of crude oil or less per stream day. Plant investment costs are kept at a minimum by the use of shop fabrication, standardization of flow sheets, pre-engineering of a large percentage of the plant, and a standard plot plan which could be modified slightly for particular conditions, according to Southwestern Engineering Co., who designed and constructed the new facilities. Another major cost-cutting feature is an oil-well-derrick-type structure for the catalytic cracking section. The T.C.C. process is licensed by Socony-Vacuum Oil Co., Inc.

Fig. 2—Package T.C.C. unit at Vickers Petroleum Co.'s Potwin, Kans., plant, showing derrick-type structure.

Feed preparation . . . The T.C.C. feed-preparation section of these package plants can be arranged to permit handling either hot or cold gas oil, or topped crude. Products from the fractionation section can be heat exchanged for maximum economy where thermal cracking is not utilized, or the heavy catalytic cycle oils can be charged directly to a thermal cracker. A vacuum unit can be made part of the feed-preparation section to produce a heavy gas oil which is charged as liquid to the T.C.C. reactor. The T.C.C. units are designed to handle a combination of vapor and liquid feed although these are charged as separate streams to the reactor. The vacuum unit receives its charge directly from the T.C.C. feed-preparation atmospheric flasher. The operating temperature of this atmospheric flasher is such that additional heat for vacuum flashing is ordinarily not necessary.

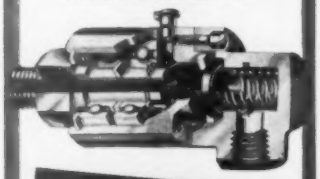
Cracking section . . . The Vickers T.C.C. unit at Potwin has a nominal fresh feed capacity of 4,000 bbl. per stream day of gas oil, plus 2,500 bbl. per stream day of recycle oil, operating at approximately 75 per cent conversion level. In operation, catalyst at about 950° F. flows by gravity from the separator surge tank at the top of the unit into the reactor, which operates at 10 psi. Spent catalyst flows by gravity from the bottom of the reactor into the top of the kiln. The catalyst kiln or regenerator consists of two identical kilns, each with a design carbon burning capacity of 1,650 lb. per hour. The double-kiln arrangement was desirable from the standpoint of flexibility of operation. It also permitted complete shop fabrication, whereas a single kiln would have involved higher-cost field fabrication. Regenerated catalyst leaves the kilns at 1,250° F. and flows by gravity through shell-and-tube coolers where steam is generated while catalyst temperature is reduced to about 1,000° F., catalyst then flows by gravity to the lift pot at the bottom of the unit. Low-pressure air at 3½ psi. is introduced into the lift pot to carry the regenerated catalyst to the separator at the top of the unit to complete the cycle. This air-lift system replaces the bucket-elevator lifts used in the early T.C.C. units.

Derrick structure . . . The T.C.C. catalytic cracking section at Vickers features an oil-well-derrick-type structure. The derrick is completely erected prior to installation of vessels. Rigging costs are thereby kept at a minimum since the derrick can be used in place of heavy rigging equipment which must be erected at the job site and dismantled on completion. Design of the entire plant is governed by two predominant operating considerations: (1) flexibility and (2) economy of operation. Exchanger bundles are arranged for ease of removal and structures over the exchanger banks are permanently installed with trolleys to facilitate maintenance.

(Continued on page 139)

REDUCE

"Down-Time" and Maintenance



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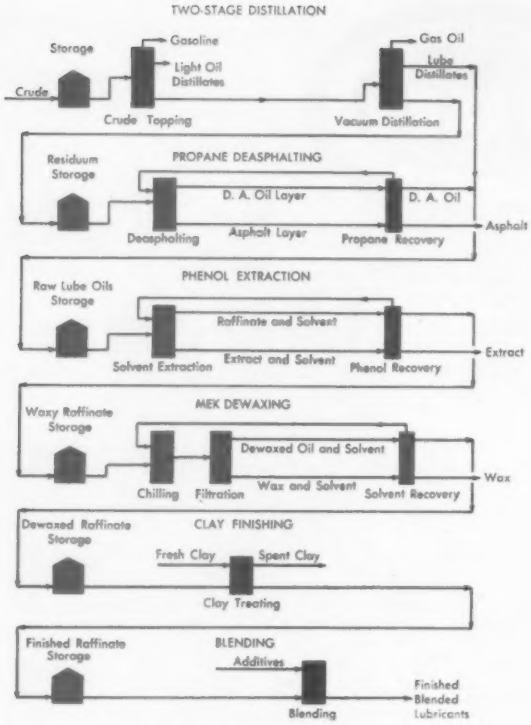

Fig. 1—Lube-oil processing system.

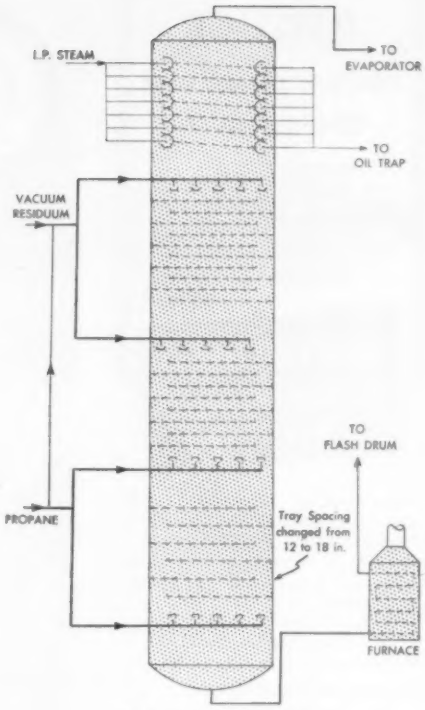

Fig. 3—Deasphalting tower.

by E. P. King*

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Lubricating-Oil Manufacture?

. . . Some aspects of the subject, with emphasis on operation of modern solvent refining processes

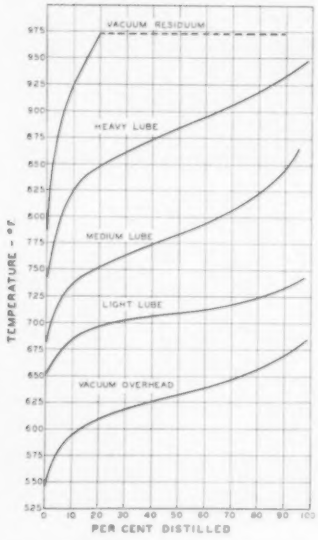

Fig. 2—Distillations on vacuum-tower fractions.

THE boiling range and degree of stripping of distillate fractions, and the front-end distillation of residuum have a substantial influence on yields, throughputs, and operating conditions in processing lubricating oils.

Deasphalting, extraction, and dewaxing operations are affected by the front-end distillation and the degree of stripping of the residuum fraction produced in the vacuum-distillation operation. The influence on dewaxing operation is especially troublesome.

One of the principal variables in propane-deasphalting operations is the purity of the propane solvent. Presence of contaminants such as ethane, butane, or propylene have an effect on the results obtained. This effect is determined by the nature of the charge and by the product desired.

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*Pure Oil Co., Nederland, Tex. Presented at W.P.R.A. regional meeting, Beaumont, Tex., February 12-13, 1953.

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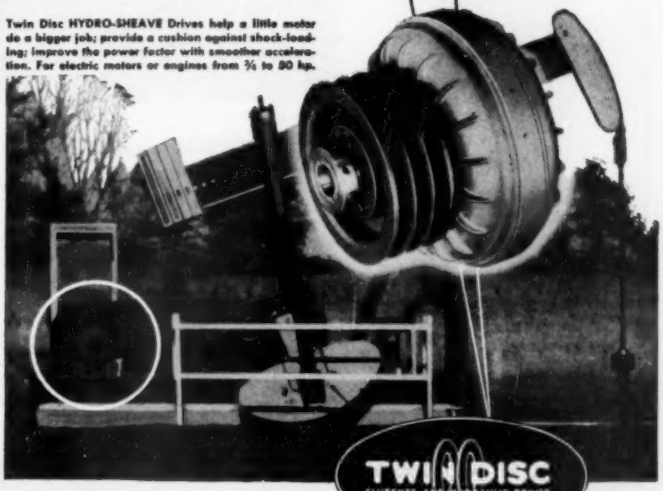

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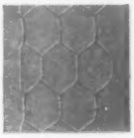

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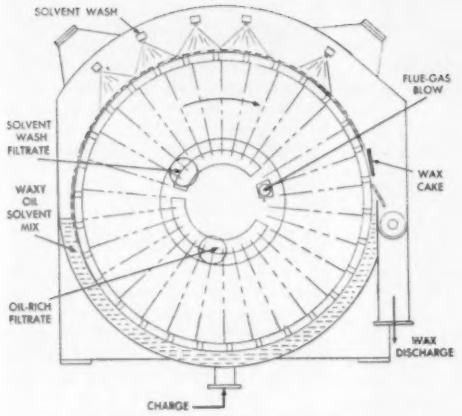

Fig. 4—Diagram of a Conkey solvent-dewaxing filter.

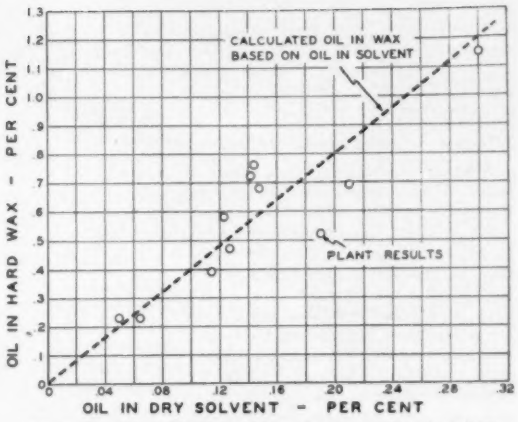

Fig. 5—Wax recrystallization, oil in hard wax vs. oil in dry solvent.

border-line curve on the limiting residual stock without oil separation.

Fractional Distillation of Raw Lube Stocks

Operating techniques important . . . When a processing system such as outlined in Fig. 1 is used, it is readily apparent that the boiling range, flash, and viscosity of the finished lubricating stocks are largely determined in the vacuum distillation step. On the other hand, it is not so obvious, nor is it as generally recognized as it should be that the boiling range and degree of stripping of distillate fractions, and the front-end distillation of residuum have a very substantial influence upon yields, throughputs, and operating conditions in the succeeding processing steps.

Distillation operations . . . Actual operating experience as well as experimental results and theoretical considerations are combined in conclusive evidence that deasphalting, extraction, and dewaxing operations are very substantially influenced by the front-end distillation and degree of stripping of the residuum fraction produced in the vacuum-distillation operation. The influence upon the dewaxing operation in some instances is especially troublesome. Similarly, the degree of stripping and particularly the boiling range of lube distillates have been observed to exert a strong influence on extraction and dewaxing.

The effect of boiling range of these stocks on dewaxing results has been outstanding. In fact, in certain instances it has been found expedient to adjust the viscosity of finished neutrals so that distillates of optimum boiling range could be produced for the dewaxing and recrystallization operations. Such a modification, of course, is entirely practical in a lube-oil processing system of the type shown in Fig. 1. Typical distillations on vacuum tower fractions produced under such conditions are shown in Fig. 2.

The distillation tests shown in Fig. 2 were run under vacuum, but the temperatures given have been converted to atmospheric pressure.

It will be noted that the front-end distillations of the light and medium lube fractions have relatively gentle slopes. The slopes of the front ends of of the heavy lube and vacuum resid are much steeper. However, the flash points on all of these cuts are relatively high.

Optimum stripping required . . . Considerable testing and experience is necessary to establish the optimum degree of stripping required for best results in subsequent processing operations. Determination of the effects of heavy ends in the distillates requires separate treatment. It is frequently found that even very small proportions of certain heavy constituents exert a pronounced influence on subsequent processing results.

Another point worthy of comment is the detrimental effect of abnormal amounts of crude tank bottoms in the crude charge. On one occasion at least, an unusually large proportion of bottoms from crude storage tanks in the field was introduced with the crude charge to the distillation step of a lube operation. The effect of these bottoms was evident in each step of lube processing from the vacuum distillation through the contacting step.

The greatest difficulty was experienced in the dewaxing operation

Solvent Refining Processes...

Solvent refining processes have been quite generally adopted in recent construction of new lubricating-oil-manufacturing facilities. The first processing step is a two-stage distillation operation where the raw lube fractions, consisting of the required number of vacuum lube distillates and a vacuum residuum, are separated from the crude.

The vacuum residuum is charged to the propane deasphalting unit where asphalt is removed and deasphalted oil is produced for charge to phenol extraction.

The deasphalted oil from propane deasphalting and the vacuum distillates from the distillation unit are each charged to the phenol extraction unit one at a time or "blockwise". In this operation an "extract" oil of poor lubricating quality and low viscosity index is separated from each stock and a "raffinate" oil of high viscosity index and improved lubricating quality is produced for further refining.

The raffinates from the various stocks charged to phenol extraction are next processed at the MEK (methyl ethyl ketone) dewaxing unit where wax is removed to produce low "cold test" lube stocks. The dewaxed lube stocks are finally finished at the contact unit by contacting with fine clay in order to remove all traces of impurities and foreign matter. The finished lube stocks are blended as required for finished lubricants.

where yields and rates were most adversely affected. This experience in a solvent-refining plant is an example of the fact that care in handling of the crude charge to lube-oil operation is highly important.

Propane Deasphalting of Residuum

Propane deasphalting is a process which is now quite generally used in the production of bright stock from crude residue. The unusual selectivity of the process and its flexibility have been emphasized in the literature.[2]

Unfortunately, relatively few actual data have been published regarding the influence of such factors as (1) the presence of ethane, butane, propylene, or water in the propane solvent, (2) the effects of solvent ratio, temperature gradient, and pressures, or (3) the effect of space-velocity relationships on deasphalting results.[3]

Contaminants of propane . . . There is considerable difference of opinion regarding the degree of influence upon deasphalting results caused by the presence of ethane, butane, or propylene in the propane solvent. After consideration of the differences which exist between stocks and other variables in these plants, it is finally concluded that the effect of these contaminants is largely determined by the nature of charge and product desired and other conditions existing in the various units under consideration.

An interesting demonstration of the effect of a simple change in spacing in the bottom of a deasphalting tower upon asphalt solution leaving the bottom of the tower was developed recently. In this case, nine baffle trays in the bottom section of the tower originally spaced 12 in. apart were removed and replaced with six trays spaced 18 in. apart. The modified tray spacing is shown in Fig. 3.

It will be noted that the distance between trays was increased in the zone just above the lower propane inlet. Before this change was made, it was impossible to introduce the desired volume of propane in the bottom inlet without causing an excessive propane content in the asphalt solution furnace feed.

This relatively simple change caused a reduction of the propane content of asphalt solution leaving the tower from the order of a propane ratio of 1.7 to 1 before the alteration to a propane ratio of less than 1 to 1 after the trays were respaced.

The phenol-extraction process has been included in a large proportion of the modern solvent-refining plants for lube manufacture now in operation.

Temperature-gradient effects . . . After 3 years of operation in which temperature gradients[4] ranging from zero to as much as 30° F. have been employed, the following tentative conclusions have been reached.

1. The use of a zero or low-temperature gradient exerts a stabilizing influence on the operation of the treating tower.

2. The use of a limited temperature gradient combined with an optimum amount of water in the bottom of the treating tower produces the maximum yield of raffinate of given viscosity index.

3. The major portion of the temperature gradient should be between the oil feed point and the top of the treating tower.

Raffinate considerations . . . Stability of operation and yield of raffinate of improved viscosity index quality is favorably influenced by the following factors.

1. Relatively high solvent ratio and relatively low treating temperature should be used.

2. Oil-feed temperature and temperature and amount of phenolic water

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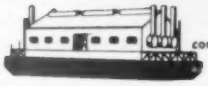

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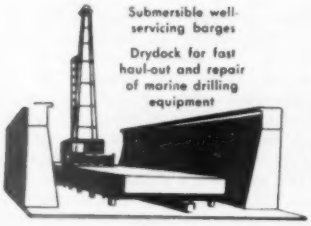

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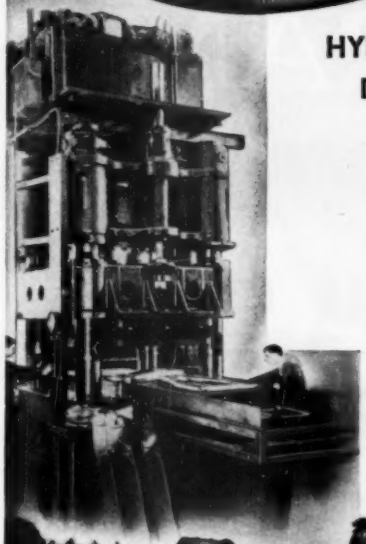

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injections should be adjusted to produce a minimum temperature and viscosity of extract solution consistent with the satisfactory separation of a clear bottom-effluent stream.

3. Temperature of phenol feed should be set to result in a top temperature on the treating tower which is just below the point at which flooding or instability of tower operation becomes evident.

4. Phenol feed to the treating tower should contain water when high yield and a low degree of viscosity-index improvement is desired. The use of water injection in the top is even more definitely advantageous at times when it is desired to depress the degree of viscosity-index improvement in relation to the improvements desired in certain other properties of raffinate, such as color or emulsion characteristics.

All phenol-extraction units suffer from corrosion problems to a greater or lesser degree. The corrosion is generally localized to a large extent in the phenolic water and extract solution recovery systems.

MEK-Toluene Dewaxing

The MEK dewaxing process shown in Fig. 1 has found a wide application in the lube-oil refining industry. The solvent which originally consisted of a mixture of methyl-ethyl-ketone, toluene, and benzene has in recent years in most plants been more or less gradually changed into a mixture consisting exclusively of methyl-ethyl-ketone and toluene. This change has occurred chiefly as a result of a reversal in the relative costs of toluene and benzene.

The MEK dewaxing process as conducted in most commercial units is involved with a large number of operating variables which require a high degree of coordination to produce best results. An examination of the diagram shown in Fig. 4 indicates some of the physical complexities which must be dealt with in the practical operation of this process.

Single solvent used . . . The dewaxing process in a lube-oil processing system of the type outlined in Fig. 1 has special limitations which serve further to complicate control of the operation. In this system the MEK dewaxing process must handle both distillate and residual stocks with a single solvent mixture. Consequently, the MEK content of the solvent is limited by the maximum amount which is permitted by the character of the residual stock. The method developed by Hall and McCarty[5] for establishing border-line miscibility relations for the stocks to be dewaxed is relatively simple and has proved to be a fairly indicative guide of optimum solvent composition for the critical stock.

MEK proportions change . . . On the first trial in plant operation of an MEK content of dewaxing solvent at or slightly below that indicated by the border-line curve, it frequently happens that evidence of oil separation shows up, and it is necessary to cut back to lower MEK proportions. In a certain plant where such a situation developed, the MEK content of the solvent was subsequently increased to the value indicated by the border-line curve on the limiting residual stock without oil separation. Adjustment of various operating conditions including (1) dilution ratios, (2) wax-cake thickness, (3) wash application, and (4) chilling temperatures was necessary to allow this increase.

From this experience it was concluded that the border-line curve is a more reliable guide than was first realized. Evidently, improper plant operating conditions were principally responsible for the initial oil separations.

Loss in oil viscosity . . . It has also been noted that one of the first indications that the MEK content of solvent has reached the point where inci-

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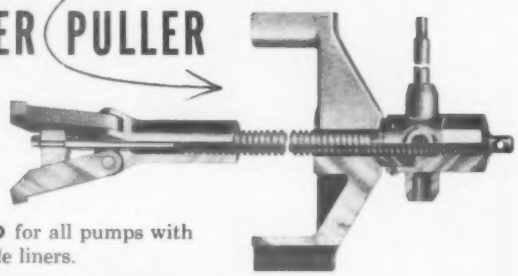

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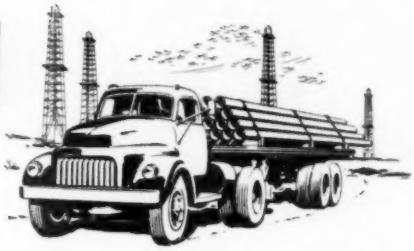

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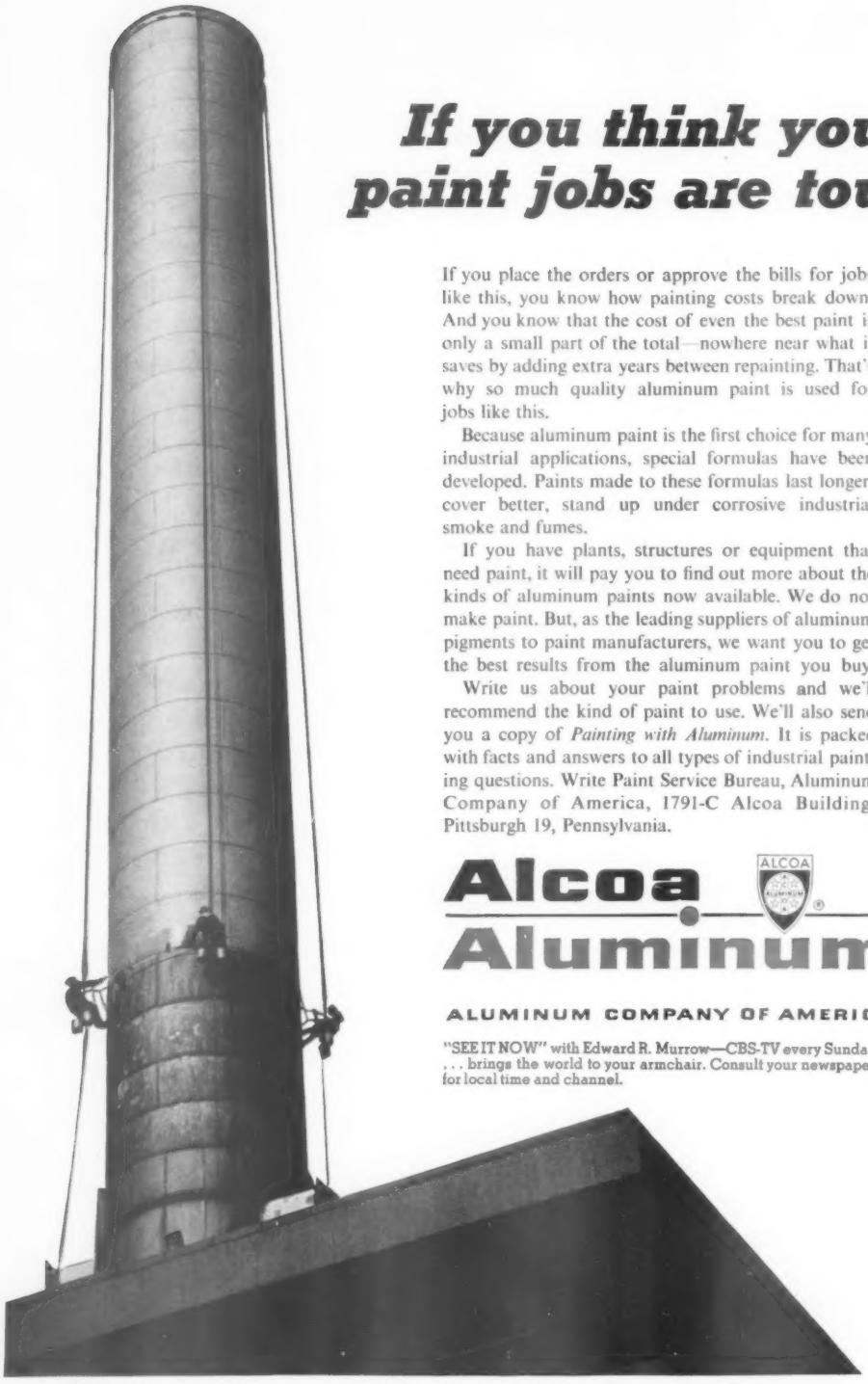

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pient oil separation may take place is a loss in viscosity of dewaxed oil. This loss in viscosity, or rather lack of normal gain in viscosity in dewaxing, occurs before other evidence such as loss of yield or throughput is apparent. Of course, the possibility of loss in viscosity due to other sources must be taken into consideration when applying this factor as evidence of reaching border-line conditions.

The use of the optimum MEK content in dewaxing solvent hinges to a considerable extent on the creation of an optimum set of operating conditions in the dewaxing process. To establish the optimum conditions in a given plant dewaxing operation involves the coordination of numerous complex factors. A certain amount of adjustment of conditions can be done most efficiently by trial and error. On the other hand, a certain degree of theoretical evaluation can be used as a guide in the regulation of such factors as dilution ratios,[6,7] drum speed[6b] as well as in the determination of optimum solvent composition.[5,7]

Recrystallization . . . The importance of effecting a high degree of displacement in the washing action which is an important part of good filter operation is perhaps best demonstrated by the results obtained on a filter in a wax recrystallization operation. In this operation, slack wax from four continuous dewaxing filters is diluted, dissolved, then recrystallized and continuously charged to a fifth filter on which the recrystallized wax is filtered, washed and removed in admixture with approximately three volumes of wash solvent.

Fig. 5 shows results of plant operation of such a recrystallization filter in which the oil content of recrystallized hard wax is plotted against the oil content of wash solvent used. The results which stand out are those in which the oil content of wax is equal to or slightly less than that which is accounted for by the oil present in the solvent which existed in the hard-wax mix before recovery. In these instances displacement by the wash liquid was practically 100 per cent complete.

Referring to Fig. 5, in those cases in which the results fall substantially on the dashed line, it appears that the oil content of the deoiled or hard wax originated entirely from the oil present in the wash solvent. Consequently, this factor rather than the filter operation limited the reduction of oil content of hard wax. In these instances, it would seem that measures to reduce the oil carryover in recovery of wash

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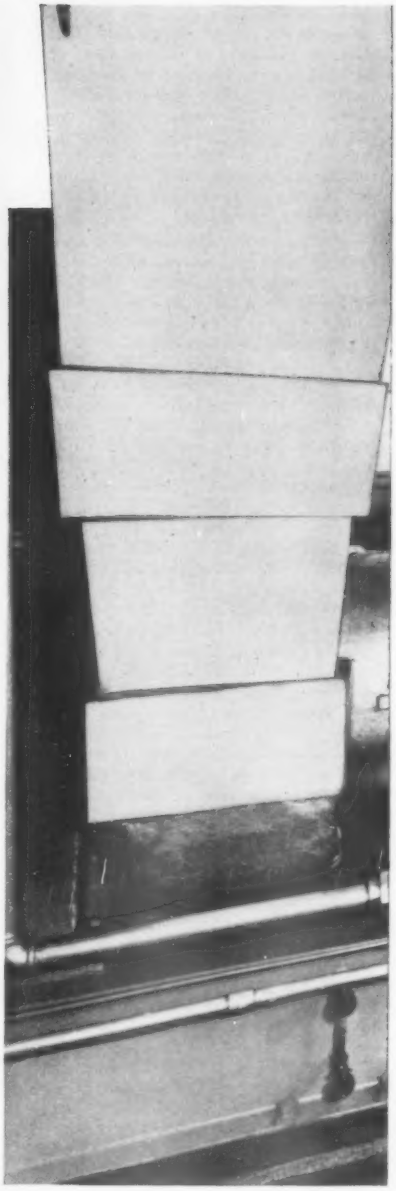

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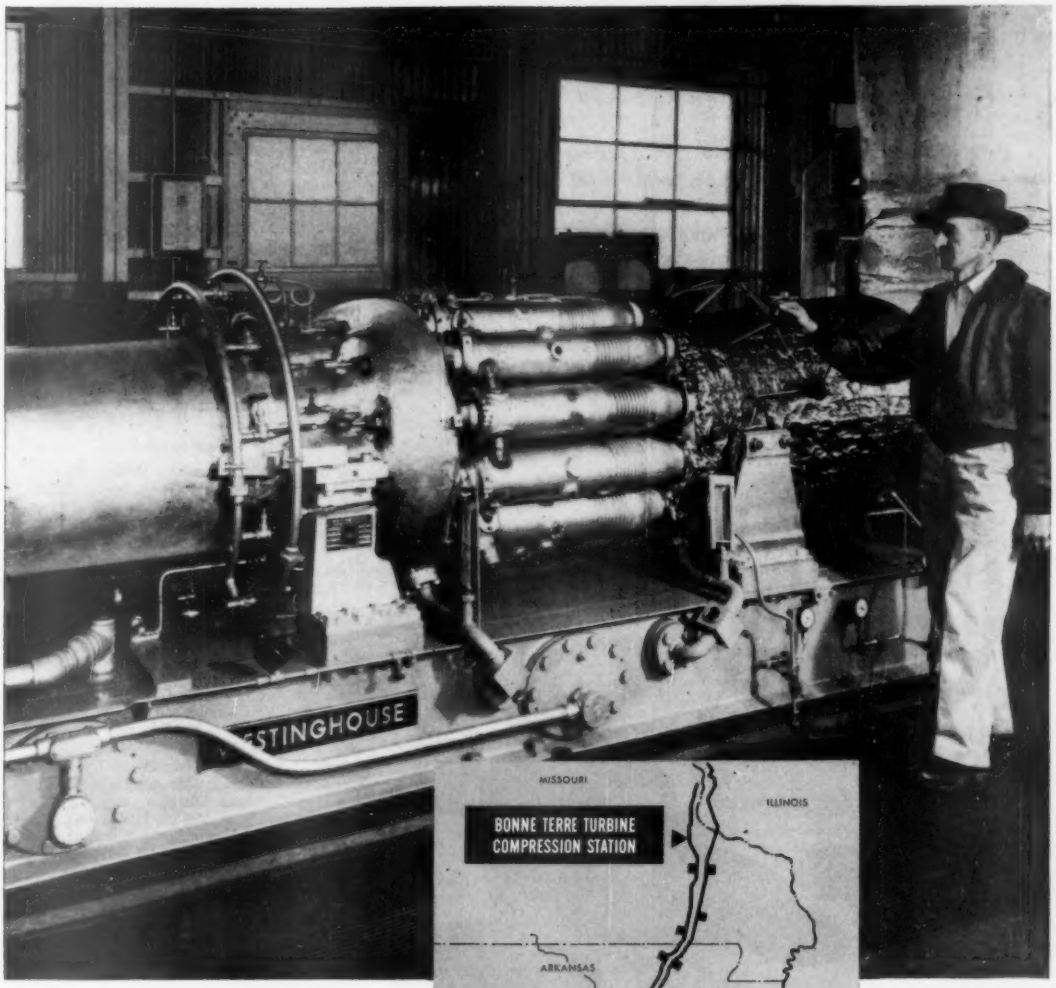

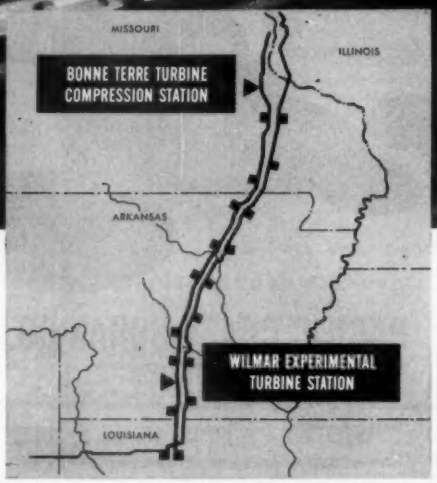

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solvent would be the next logical step toward further reduction of oil in the hard wax.

Contact Clay Finishing

The contact filtration process is widely used among petroleum refiners as a final treatment of solvent-refined lubricating stocks to remove the last traces of resins, color bodies, acids, and other undesirable constituents. This process is simple and direct. The proper manipulation of a relatively few operating variables involving chiefly the temperature, time of contact, and clay dosage is the chief basis of control of the quality of finished products.

Improvement of flash and fire point may often be effected during contact clay finishing by stripping any light ends. Stripping may be done with superheated steam, vacuum or a combination of vacuum and steam. Vacuum improves the decolorizing action of the clay.

The use of relatively high vacuum during the contacting step is being applied in a number of commercial installations with unusual results.

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Monitoring of Process Variables

(Continued from page 99)

high-speed scanners can be designed so they will operate at 20 points per second with an accuracy of about plus or minus 2° C.

Fig. 4 shows a mercury jet switch developed at General Electric Co., Richland, Wash., and described by Rodley Huff (I.S.A. conference, September 1952). This switch is operated by a jet of mercury driven by the rotating cone so as to impinge on platinum pins located around the periphery of the unit. The author states that it has been operated at rates up to 1,800 points per second with a noise level of only 20 microvolts across 20 ohms, which is very low. While this switch is not available commercially, its development should open up possibilities for much higher scanning rates than have been possible with ordinary stepping switches.

Indicating systems . . . Indicating the actual temperature is of relatively little significance in a scanning system because of the high speed at which the points are monitored. In some of the slower speed scanners an indicator might have some significance, but in scanners that operate at 10 points per second or faster it is impractical to use the standard type of indicator because the mechanism would wear out in a very short time.

For this reason, indicators or recorders are usually connected to the scanner in such a manner that they only come into play during abnormal conditions. At such times the scanner is usually stopped or its speed slowed down to an extent that makes the indications readable. In a truly high-speed scanner the detector is usually an electronic amplifier entirely independent of the registering instruments. This amplifier can respond practically instantaneously and, since it has no moving parts, will not wear out as would a recorder or indicator.

Several ingenious methods have been devised for indicating abnormal conditions. Fig. 5 is a scanner for a large number of thermocouples equipped with a coordinate lighting system to show the location of the point being scanned. When any point exceeds a high or low limit these lights together with the annunciator system at the top of the panel show which point is causing the alarm and the annunciator system shows whether it is high or low. The recorders are not normally connected to the system when it is operating at high speed but the speed can be slowed down by the operator so that the recorders can be connected and a chart made of all of the operating points.

Plug and jack board . . . This serves a number of purposes. The recorders can be continuously plugged in to any point or groups of points which it is desired to study and these points are then recorded independently of the main scanner. They can also be plugged into a second set of jacks located on the sloping shelf below, which are connected to a high-speed scanner with only 200 points. This auxiliary scanner monitors the unit at a very high speed and makes sure that selected points are within their desired limits, even while the master scanner is slowed down during a recording cycle.

An alternate method of mapping high-speed scanners was also described by Huff, referred to above. In this case a large oscilloscope is energized in synchronism with the main scanner and any deviation is recorded by the intensity of light spots on the tube. This type of unit is probably limited to between 50 and 100 points per tube and might thus be fairly costly. Furthermore, visual recognition of variable light intensities might offer real problems both from the standpoint of eye

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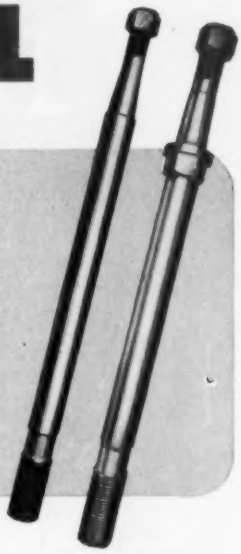

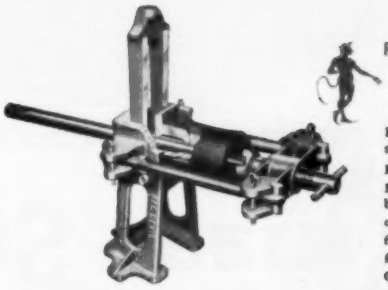

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Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, Calif.
Electric Resistance and Fusion Weld—Plain End	8⅝" to 20" O.D.	Up to 40'	.188" to .500"	Napa, Calif.—Basalt-Kaiser
Electric Resistance Weld—Plain End	5⅛" to 12¾" O.D.	Up to 55'	.188" to .375"	Fontana, Calif.
Electric Fusion Weld—Expanded—Plain End	22" to 30" O.D.	Up to 40'	.188" to .500"	Napa, Calif.—Basalt-Kaiser

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fatigue and from the variation in visual acruity between various individuals.

Another method that has been used successfully is the substitution of neon lamps in a coordinate system, and triggering these lamps by the amplifier detector whenever any point deviates beyond its predetermined limits. This is accomplished by adding another row of switch contacts to the stepping switch thus selecting the corresponding lamp for each thermocouple. Once the lamp is triggered by impressing a voltage above the ignition voltage, it will stay on until it is manually reset by removing the biasing voltage. This type of signal has been operated successfully at a speed of over 20 points per second.

Alarm limits . . . If all the temperatures or variables being scanned have the same deviation limits, then only one control point setting is necessary. Very frequently, however, it is necessary to set each point or each bank of points at a different value. This is accomplished by an additional bank of switches on the stepper which are wired into the detector circuit in such a way that each can, if necessary, be connected to a separate potentiometer for setting each point. By careful arrangement of the terminal blocks these can be interconnected in the field at will so that as many points as desired can be connected to a single control point setting. These potentiometers are small and compact and hundreds of them can be grouped on a small panel located within the cubicle.

4. Automatic Scanning Record

Fig. 6 is a 576-point segmental recorder developed by du Pont and constructed by Panellit using the basic mechanism of a Minneapolis-Honeywell strip-chart single-point recorder. This recorder operates at two points per second using a ballistic printing mechanism. Each daily chart consists of a 12-ft. continuous roll of standard strip chart, 12 in. in width. At the end of each day it draws 144 curves, each 6 in. long, and each using one-sixth of the width of the chart. Each point on the curve is actually four consecutive readings from four thermocouples and thus each 6 in. of chart travel superimposes the readings of four group thermocouples. (The mechanism will be described in a paper by L. P. Haner of du Pont, at the I.S.A. conference at Chicago, in September 1953.)

Digital type recorders . . . Recently a number of large scanners have been equipped with digital converting mechanisms so that the recording can be performed by a standard type of teletype, automatic typewriter, or tape recorder. A number of these type recorders are now available on the market and can be readily coupled to scanners, but before this can be done the readings must be transformed from voltages into digital units, either in the form of on-or-off impulses or selective switching positions.

Digital converters are generally of two types, either electromechanical or electronic. Electromechanical converters are merely switches which are positioned by the potentiometer mechanism, or its equivalent, in such a way that for each position a different set of contacts is made by a wiper switch. In the electronic converter the voltage is fed directly into an amplifier which triggers a number of individual vacuum-tube circuits, each of which controls a relay. For each decade, four such triggering circuits are necessary. Thus, for 100 numbers 8 circuits or channels are necessary and for 1,000 numbers 12 circuits.

One multiplex coding which is usually adapted for wire transmission consists of five channels, each requiring six wires and gives a coding of one decade from 1 to 10 and a complete alphabet with the punctuation marks usually included on a standard typewriter. The coding systems usually used in teletype work consist basically of pulse trains of both positive and negative polarity and transmission may thus be accomplished with a single circuit.

Teletype system . . . Any standard teletype unit or automatic typewriter can be operated from a scanner having the proper digital converter. Fig. 7 is an example of a standard, electrically driven automatic typewriter, which can be completely operated by a five-channel digital converter. Although this typewriter is equipped with keys, these have nothing to do with the automatic recording. The purpose of the keys is merely to permit an operator to add notations or headings to the chart. There is an automatic tape-punching and tape-reading device at the side of the typewriter. The rear section of this device punches holes in a roll of tape. This tape can then be fed into any I.B.M. or similar machine for recording on a master punch-card system if desired. As an alternate this tape can also be rerun through the tape reader shown at the front left and the entire message thus retyped. Fig. 8 is a sample of a chart made from this typewriter.

These machines, of which there are several available on the market, can integrate the recorder readings into any statistical analysis system that is part of the plant accounting system. In one large installation where analysis on a statistical basis forms an important part of the research work in improving the process, every reading on the tape is transferred to a separate I.B.M. card. At a moment's notice, therefore, a study can be made of the characteristics of any single point, or any group of points, or any point that deviates beyond any predetermined temperature limit merely by using the standard techniques of the punch-card system.

Memory circuits . . . When recorders are used in confection with scanners, it is usually necessary to slow down the scanner while the record is being made because of the slower operating speed of the present-day commercial recording systems. An alternate method, however, where slowing down is undesirable, is the use of memory circuits. These may consist of condensers or magnetic circuits and a switching circuit which is so arranged that when several alarms occur in rapid succession, the memory devices are immediately charged to different values of voltage by the scanning detector. It is only necessary for the scanner to be connected to these memory devices for a very short time and then move on to a next point but the charge can very easily be retained for 5 to 10 minutes or even more if necessary.

When one of the condenser memory devices is charged and the scanner moves to the next point, this condenser is connected by a switch to the digital converter which sets up the reading for the teletype or typewriter. It may take 5 to 10 seconds for this recorder to finish typing the entire message since it may extend across an entire line. When this message is finished it actuates a switch, which snaps the typewriter back ready for the next position and connects the digital converter to the next memory circuit which was charged by the scanner. The typewriter then proceeds to type the second message and so on, until all of the alarm points are accounted for.

Since each of these memory circuits and switching circuits adds to the expense, it is not normally the practice to utilize more than 10, 20, or 30 memory circuits even in a scanner having several thousand points. In addition, it very seldom happens that more than 20 or 30 alarms go off at one time, and if they do, it usually means such a breakdown as to involve a complete shutdown of the system. Even during a complete shutdown, however, it is usually desirable to know which of the alarms were the first ones to go off, thus making it possible to make a study of the events that led to the shutdown. Therefore, the number of memory circuits can be limited to the number of initial points that might have to be studied.

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5,000′ with 4½″ drill pipe
6,000′ with 3½″ drill pipe

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- ★ Mast — Wilson 96′ Portable cable raised
- ★ Derrick floor working area — 20′ x 20′
- ★ Stationary rotary table (can be removed if need be)
- ★ Hinged screw jacks (Always in place)
- ★ Complete control of Rig by Driller at all times
- ★ Driller operates complete preventer system from his control panel position
- ★ Trailers keyed together for perfect alignment at well head or drilling site.
- ★ Weight buckets, tongs, and traveling block stay intact at all times during moving of rig.

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WICHITA FALLS, TEXAS

Vickers Petroleum Ups Throughput

(Continued from page 120)

The compressor house is also equipped with trolleys to permit rapid dismantling and replacement of compressor parts. The control room features a semi-graphic control panel with a system of alarms to call attention to process upsets. Instrumentation of the catalytic section is so designed that power failure or major upsets will cause immediate bypassing of the unit and automatic shutdown. Process flow is schematically diagramed on the control panel and a color code system employed to indicate process lines and control points.

In addition to installing the new T.C.C. unit, an existing UOP solid phosphoric acid type catalytic polymerization unit was expanded to process the cracked gases and produce high-octane polymer gasoline. Fractionating facilities for the production of liquefied petroleum gases were also included and the crude unit was completely revamped and doubled in capacity to 12,000 bbl. per stream day.

The engineering and construction were under direction of T. Ben Arnold, manager and chief engineer of the refinery division of Southwestern Engineering. Del Kelley was construction superintendent. Arnold was also in charge of the first T.C.C.-Sweco unit constructed at Artesia, N. M., for New Mexico Asphalt & Refining Co. last year *(The Oil and Gas Journal, January 21, 1952, page 92)*.

A. M. Schrepfer is vice president and general superintendent of the Vickers refinery at Potwin. R. N. Moore is assistant superintendent.

Dedication of the new facilities will be at a dinner in Wichita on Friday, March 20. Bruce K. Brown, former deputy administrator of PAD and president of Pan-Am Southern Corp., will be the principal speaker.

New Trailer-Mounted Workover Rig

(Continued from page 118)

bottom of crown block to derrick floor is 96 ft. The rig is capable of performing workover jobs to depths of up to 15,000 ft. with 2½-in. tubing or 2⅞-in. drill pipe. The unit is primarily a drilling rig rated at 6,000-6,500-ft. depths with a string of 3½-in. drill pipe.

Guy lines are used to support mast during operations. Three ¾-in. lines run from top of mast to rear of the rig and two ¾-in. lines tied to the center of the mast are secured to the read edge of the doghouse.

Tearing down . . . In tearing down rig, A-frame on substructure trailer is used for telescoping mast and then lowering the mast so that it rests on headache rack placed on the front section of substructure trailer. The A-frame itself is then lowered so as to rest on the mast. Cat walks are collapsed and secured to the trailer bodies, and the runway extension is dismantled and carried on subsurface trailer.

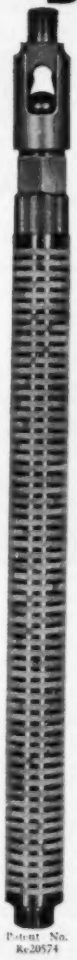
Vaporproof lighting fixtures on the mast are so arranged that they need not be removed when mast is telescoped, nor do the tong weights, tongs, standpipe, and rotary hose. Likewise, the block is kept strung up throughout moving of rig. The chain drive to the rotary is broken and chain is coiled on derrick floor when moving. Turnbuckles are broken between the two trailers, wire line slipped out of drum on draw works, various hose connections broken, and it only remains for jacks to be raised clear of the ground before both trailers are ready to be moved.

C-B Drilling Co., Inc., is a partnership between L. W. (Charlie) Campbell and Joe Beard.

Mast and draw works were manufactured by Wilson Manufacturing Co., Inc., Wichita Falls, Tex.

Both trailers were fabricated by Henderson Welding Works, Houston.

BETTER EQUIPMENT REDUCES COST!



Patent No. Re20574

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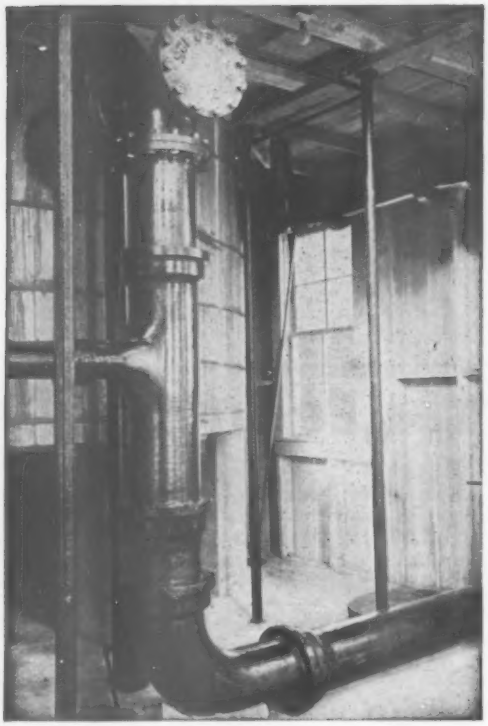

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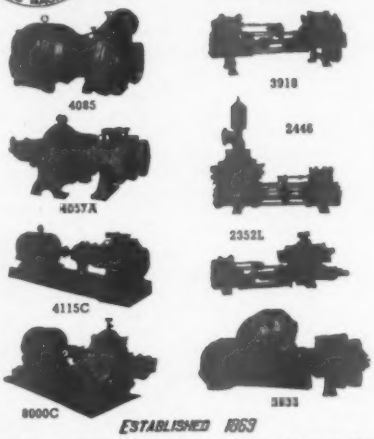

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S&R Steel Mud Pits are skidded on 6" H-Beams, with heavy cross-braces along the length. Skids are 8' wide and 33' long; the pits may be hauled on any standard oil field trailer. Beams are recessed at each end, so that the winch line may be snubbed or wrapped around the ends of the braces for speed, safety and convenience in loading and unloading.

Write for further information and catalog.

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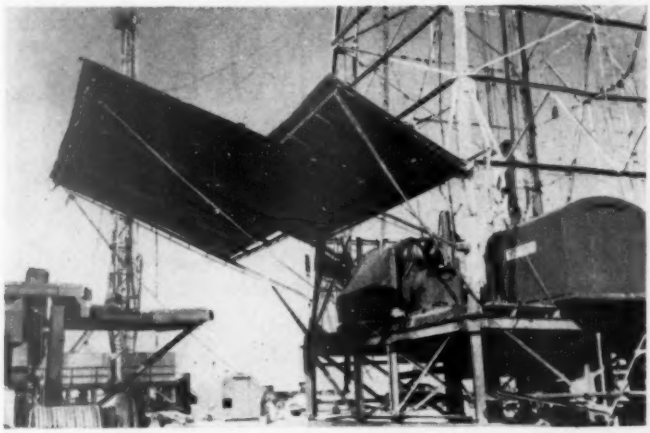


Portable roof sections travel with drilling rig

EVERY hour saved while skidding and rigging up a rotary drilling rig means a difference in profit or loss.

Realizing this, Trinity Drilling Co. has equipped its derrick at Lovington, N. M., with roofs which remain with the derrick when operating, skidding, or storing in the field.

The roofs are made in two sections —the upper one is narrow and shields the draw works; the main section covers the drilling engines and related equipment. Both are of sheet metal, fitted with truss-type rafters and angle-iron sheathing to which the sheet metal is attached.

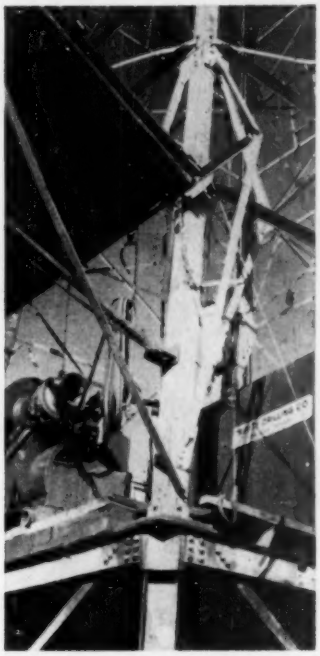
Moved easily . . . Hinges to which the roofs are attached are welded permanently to the legs of the derrick, but are provided with pins and bolts so the sections can be removed when necessary. The upper section has two diagonal braces attached to the outer corners to support it when in operating position, by setting the free ends in sockets attached to the engine substructure.

When preparing to skid, these braces are brought forward to the structure and set into sockets attached to the footing of the derrick legs so as to form a substantial brace while the roof's outer edge is lifted up.

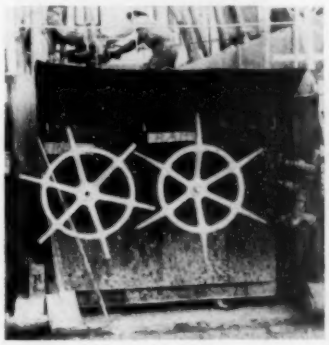
The lower and larger roof section has extensions permanently attached to the two outside sills, or rafters. These are cut to the desired length when building the unit, to extend toward the derrick and connect with substantial lugs welded to one of the derrick legs on each side of the draw works. When set in position after the equipment has been rigged up, supporting studding, or posts, is used, which socket into ferrules placed at the proper position on the engine substructure.

Wire lines used . . . When preparing to remove the drilling equipment from the well, wire lines are employed with the derrick line to raise both roof sections to the required height so that cranes can lift the engines and other machinery outside the derrick floor. These lines are attached to girts, up the structure, and made fast to hold the sections in a predetermined position.

The narrow section is held rigidly in a raised position with the diagonal braces and the wire lines. The larger section is supported by wire lines, and prevented from being lifted up when high winds are prevalent by anchor guy lines attached to each outer corner, and back to the legs of the derrick substructure.



ROOF is designed to remain attached to derrick when skidding (left). Right: Detail of hinges for roof, and braces.



Shield Protects Crew

To protect members of the drilling crew from possible injury or from being splattered with liquids, a shield is put up around the manual-operating gate wheels of the blowout preventer. This shield is mounted on a skid-type foundation to be set on timbers at the side of the rig. Vertical posts support a backing plate, through which the gate stems extend, and a "lean-to" roof offers complete protection.

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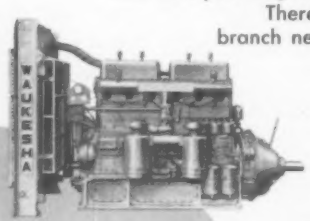

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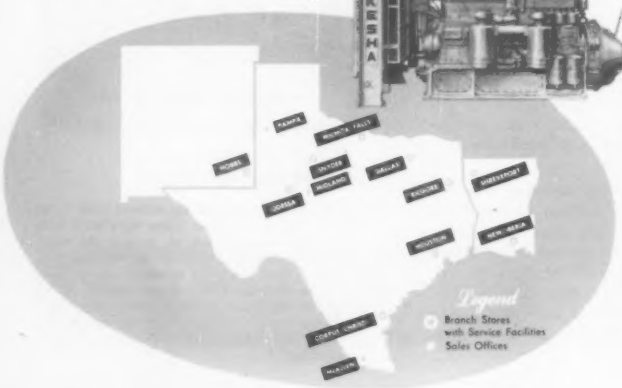

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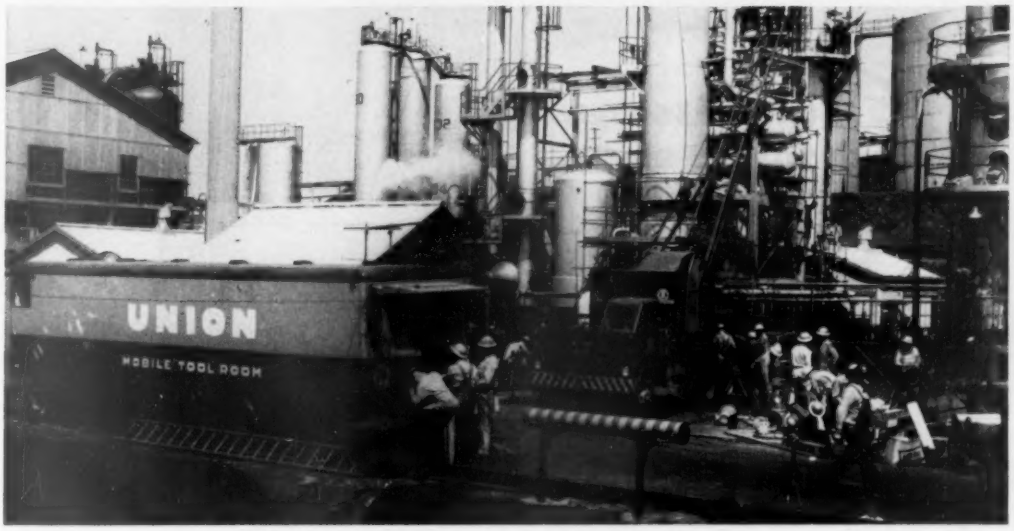


UNION OIL CO. of California uses mobile tool room, says it saves time.

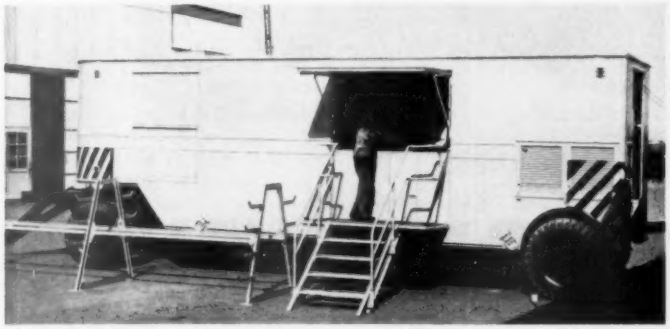
Mobile tool rooms prove their efficiency

AT least two oil companies have adapted semitrailers for use as mobile tool rooms at their California refineries. Both report they save much time and cut down on traffic from the refinery job site to the main maintenance depot.

Union Oil Co. of California uses such a mobile trailer (see picture at top of page). Shell Oil Co. has another in use at its Wilmington, Calif. refinery. (The Shell trailer appears below, and an interior view is at right.)

Fully stocked . . . The mobile tool rooms carry a wide variety of tools and spare parts. An example of how these mobile units have proven their efficiency can be visualized by a recent catalytic cracking unit shutdown at Shell's refinery. During the 1-month period for the turnaround, the portable stores-tool van recorded 3,062 separate issues, including from 1 to 10 items per "sale." Tools issued and received numbered 3,450.

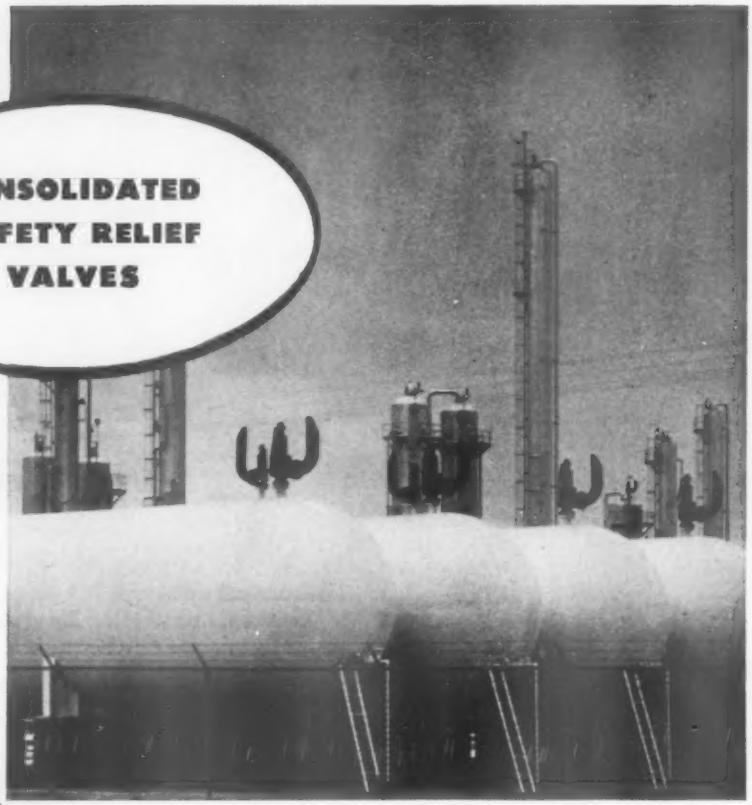
A major advantage in using the mobile tool rooms is that they cut down tremendously on the continual traffic between job site and the main plant of concentrated maintenance activity.



SHELL OIL CO. uses a 30 by 8 by 8-ft. trailer as a combination mobile tool room and warehouse at its Wilmington, Calif., refinery.

INTERIOR VIEW of the Shell Oil Co. trailer used at Wilmington, Calif., refinery. During a 1952 catalytic cracking unit shutdown, lasting 1 month, this mobile tool room and warehouse recorded 3,062 separate issues for parts. Big advantage is elimination of much traffic between job site and plant.

CONSOLIDATED SAFETY RELIEF VALVES



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CONTROL HANDLES are pulled open from outside as operator grasps funnel attached to long hose, reeled beneath canopy outside the control room, left. Right: Two 50-lb. cylinders of liquid carbon dioxide installed inside building and retained in position below header, ready for use when control handles are pulled open.

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CO_2 extinguishers placed at strategic points in refinery

CONTROL of possible burning oil spills is assured by the installation of CO_2 fire extinguishers located at strategic points in the plant of Louisville Refining Co., at Louisville.

These units are somewhat different in arrangement, and also much larger in capacity, than the usual type mounted in carts or placed on hangers attached to the walls of plant buildings. Each installation at Louisville has two cylinders. Each cylinder contains 50 lb. of CO_2, and may be placed instantly on the line, or both can be opened to operate as parallel feeders to the nozzle.

The installation of the units is always inside a building nearest the point of probable fires to protect the cylinders and to maintain a temperature high enough that a high capacity flow will be assured. Both cylinders in each setting are held firmly in position in a strap-iron cage which has a hinged section for the convenience of men who may remove spent cylinders and connect freshly filled CO_2 containers.

A manifold to which the head of the cylinders is attached is mounted on the face of the masonry wall with lag screws which retain the "A" frame brackets carrying the piping.

Mounted outside . . . The nozzle and connecting armored hose are mounted outside the building at a point unobstructed by piping stanchions or pump-house piping and valve pit.

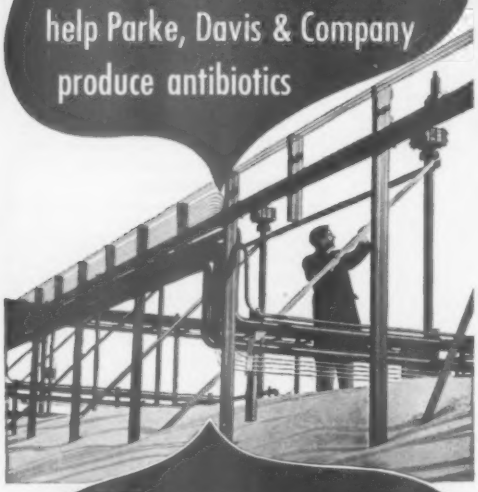
The hose is wound on a metallic reel mounted in a frame with brackets provided for attaching to the building wall with bolts or lag screws as the case may be. Feeding lines pass through the wall from the cylinder manifold to the spindle on the reel where it is connected with a packed swivel which allows the reel to be rotated at any speed generated by a man running with the nozzle in his hands.

Operation simple . . . Operation of the unit is simple. Any time its use is required, the man operating the extinguisher pulls either or both of two "D" handles attached to an operating mechanism that opens quarter-turn valves in the cylinder manifold.

Positive Sump-Drain Cutoff

In the drainage system above, the waste line passes through a wall of the tank dike and is provided with a gate valve. To prevent any liquid from escaping from inside the dike, except by intention, a swing was attached to the open end of the drain line. A steel cable attached to the swing automatically raises it above the probable level of any liquid. When the liquid inside the dike is to be removed, the operator opens the drain-line gate valve, raises the counterweight, and stands there until all of the liquid flows to the disposal system. By dropping the counterweight, the swing line raises, automatically cutting off the flow without the necessity of closing the gate valve in the drain line at the top of the dike.

More than 4 miles of ALCOA Aluminum Tubing help Parke, Davis & Company produce antibiotics



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Engineering Reference
SECTION

GAS TURBINES AND CENTRIFUGAL COMPRESSORS—6

Starting and Stopping

by T. R. Rhea* and J. S. Quill*

ON the control panel are lights associated with two separate and independent flame detectors which are used to check the flame in the combustion chambers. The large yellow light located in the center is lit whenever there is flame in the combustion chambers. The smaller lights on either side of the large light are used to indicate trouble with the flame detectors themselves. The system functions on one flame detector with the other as backup for it.

Immediately below are the six signal lights. The top three are green and indicate that the equipment is ready to operate. For example, if one of the breakers in the motor starter control were open, one of the green lights would be out and the operator would know where to look for the trouble.

To start the turbine the operator must have the three green lights lit. He then places the operation selector switch in the "automatic" position and twists the "master" start switch manually to the start position. When he does this the green "ready" lights go out and the white light comes on indicating that the d.c. lube pumps have filled the overhead compressor seal oil tank. The white light goes out and the yellow light comes on and stays on until the starting sequence is complete.

During the time that the yellow light is on the starting turbine brings the gas turbine up to 10 per cent speed for a 5-minute purging interval. The turbine is then fired and comes up to 60 per cent (idling) speed by means of the power it can develop itself with the assistance of the starting turbine. Somewhere around 50 per cent speed the gas turbine runs away from the starting turbine and the starting turbine shuts down.

*General Electric Co. From paper presented at A.S.M.E. meeting, December 1952.

At 60 per cent speed the starting sequence is complete and the red light comes on. The entire starting requires about 20 minutes.

Operation . . . The operator has a choice of two modes of operation. He can manually control the speed of the turbines or he can turn them over to the automatic discharge pressure control.

A Bailey pressure recorder and controller for the turbine is employed. For pressure control, the operator places the selector valve in the automatic position. The regulator then feels of station discharge pressure and controls the turbine fuel (and speed) to maintain this pressure. Temperature and speed-limit overriding controls prevent the turbine from damaging itself.

When the operator wishes to manually control the speed of the turbine, he places selector switch in the "manual" position and adjusts speed by means of the knob below.

Stopping . . . When the stopping signal is given to any turbine, whether by the operator or by any of the automatic shutdown devices, a pressure ratio exists across the entire station and a station check valve will prevent the gas from flowing backward. When one of the several turbines in a station is thus shut down, the remaining ones may not be able to develop sufficient pressure ratio to immediately span the station compression ratio. Therefore, it is important that the station bypass valve be opened automatically on such signal to give a path for the gas to flow through the units without surging. If this were not done the station check valve would cut off the flow until the station compression ratio equalized, which might leave the compressors in surge for 15 or 20 minutes.

The remaining turbines in the station continue to run but are automatically brought to idling speed. When the station pressure ratio has sufficiently equalized so that the remaining turbines can span it, the station bypass can be closed and the remaining units put back to work pumping gas.

The stopping signal shuts off fuel to the turbine and it starts to coast to rest. At 40 per cent speed, the d.c. lube pump starts, and the unit is at rest in approximately 7 minutes. The d.c. pumps run 30 minutes in order to keep the bearings cool during the transient flow of heat from the hot turbine parts.

Summary . . . The reasons why gas turbine driven centrifugal compressors for main gas pipe-line pumping are becoming popular can be summarized as follows:

1. Low maintenance and operating cost. A total of five men per station is visualized for one, two, or three-unit station.
2. Short station spacing made possible by centrifugal compressors and automatic or semiautomatic nature of gas turbines result in additional capacity of pipe lines.
3. Gas turbines develop 25 per cent extra horsepower in the wintertime at no increase in installed cost.
4. No water required. Machine will run without air washer.
5. Low oil consumption. Estimated 12 gal. per month per 5,000-hp. unit including compressors. Little, if any, of this oil is passed into the pipe line which is an important advantage from a point of view of clogging the pipe.
6. Flexibility. The adjustable speed drive permits operation over wide range of flow conditions.
7. Self-sustaining; no outside electric power required for operation of the turbine.
8. No pulsations transmitted to the pipe.
9. Provision for future increased flow can be made by applying oversized compressor cases and then changing wheels and diffusers when the flow increases.

Plan to visit the exhibit of the TUBULAR EXCHANGER MANUFACTURERS ASSOCIATION at the 1953 International Petroleum Exposition located at the East end of the Exposition grounds.

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by W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

Relationship Between all Common Vaporization or Distillation Curves

"Although we were interested in the method of using Hempel curves as in your answer of September 1, 1952, it does not seem to be the relationship that we expected. Why is it different from correlations of other types of vaporization curves?" F. M. C.

The Hempel correlation of September 1, 1952, and even the Saybolt correlation of December 22, 1952, are entirely consistent with the general relationship between various distillation and vaporization curves. Note the comparison of slopes in Fig. 1, and of 50 per cent boiling points in Figs. 2 and 3, and Tables 1 and 2.

Slope relationships... All of the well-known correlation methods[1,2,3,4,5,6] were employed in preparing Fig. 1 as well as less-known methods which were sought for this comparison.[6,7,9] The Piroomov[3] and the Packie[4] methods probably constitute only one method because they were both developed by the same company. Many data on the A.S.T.M.-T.B.P. relationship became available by analysis of the T.B.P.-Flash and A.S.T.M.-Flash relationships published by several of the authors.[2,3,4,5,6] In analyzing these, flash vaporization curves were computed from T.B.P. curves and in turn A.S.T.M. curves were computed from the flash curves. The positions of the several types of distillation curves are quite consistent with one another, and the data of all investigators were in remarkable agreement except for materials of very high slope. All types of materials are represented such as crude oils, gasolines, distillates, gas oils, and cycle stocks.

Slopes were measured between the

This department was created for the purpose of aiding managers, superintendents, engineers, chemists, and all those engaged in various phases of plant operation, as well as those connected with the marketing and utilization of petroleum products. Readers are invited to submit their problems to W. L. Nelson, technical editor. Inquiries must be signed, but only the initials will be printed.

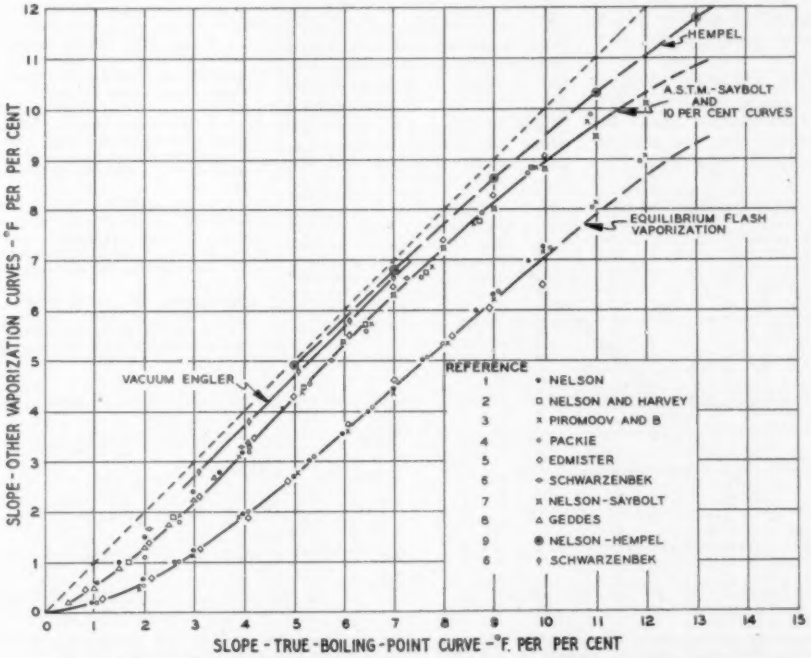
SLOPE - OTHER VAPORIZATION CURVES - °F PER PER CENT
SLOPE - TRUE - BOILING - POINT CURVE - °F. PER PER CENT
HEMPEL
A.S.T.M. - SAYBOLT AND 10 PER CENT CURVES
EQUILIBRIUM FLASH VAPORIZATION
VACUUM ENGLER
REFERENCE
1 • NELSON
2 □ NELSON AND HARVEY
3 × PIROMOOV AND B
4 ◦ PACKIE
5 ◇ EDMISTER
6 ⊕ SCHWARZENBEK
7 ⊠ NELSON - SAYBOLT
8 △ GEDDES
9 ◉ NELSON - HEMPEL
6 ◈ SCHWARZENBEK

Fig. 1—Relationships between the slopes (degrees/per cent) of various distillation or vaporization curves.

10 and 70 or the 20 and 80 per cent points whenever possible, but when the distillation curves did not extend to 70 or 80 per cent, any well-defined part of the curve was used for a slope determination. When the investigator's methods[5-7] did not employ "slope" as one of their variables, a number of typical curves were constructed and the slope relationship was developed.

Fifty per cent relationships . . . Fig. 2 is included primarily to indicate the general relationship between the 50 per cent boiling points (see Table 1 for more accuracy). With all types of distillation curves, slope had the same general effect as that shown in Fig. 1. However, lines like those of Fig. 1 were positioned lower when considering flash vaporization curves, and higher when considering Hempel distillation curves. Thus, for T.B.P. curves of a slope of 7.0, the 50 per cent points of the various types of curves are as shown in Table 2. This is a consistent relationship except that the Hempel temperatures are surprisingly high, and there is no logical explanation for higher Hempel temperatures (in almost all ranges of temperature) than the T.B.P. temperatures.

However, the author has noted this discrepancy for many years and has no reason to believe that it is in error.

The 50 per cent boiling point relationships can be determined with accuracy from Table 1 (A.S.T.M., Saybolt, 10 per cent, and Hempel) and Fig. 2 (Flash Vaporization).

TABLE 1—RELATION OF 50 PER CENT BOILING POINTS (°F.). T.B.P. VERSUS OTHER VAPORIZATION CURVES

T.B.P. 50 per cent boiling point, °F.	T.B.P. 50 per cent boiling point minus A.S.T.M.* 50 per cent boiling point					T.B.P. 50 per cent minus Hempel 50 per cent (all slopes)†
	Up to 2 slope	4-6 slope	6-8 slope	8-11 slope	9-14 slope	
100	—5					
200	—4	—5				
300	—2	—4				
400	0	—1	—18			—15
500	3	2	—12	—20	—30	—10
600		6	—5	—11	—24	—5
700		15	5	1	—13	0
800			15	21	5	5
900					50	10

*Includes A.S.T.M., Saybolt and so-called 10 per cent distillations. †Slope is also a factor but not to a significant degree.

TABLE 2—50 PER CENT POINTS OF VARIOUS CURVES FOR A T.B.P. CURVE THAT HAS A SLOPE OF 7.0

Type of curve—	500 Mid B.P., °F.	800 Mid B.P., °F.
Flash vaporization	*460	774
A.S.T.M., Saybolt, etc.	†512	815
Hempel	†510	805
True boiling point	500	800

*Fig. 3. †Table 1.

Saybolt and Hempel curves of crude oils show considerable curvature and hence the correlation methods suggested in the Questions on Technology pages of September 1, 1952, p. 117 and December 22, 1952, are probably more accurate than the method used here for purposes of comparison. When curvature is severe, it is suggested that the 50 per cent boiling points be related by using the 50 per cent points on the straight slope lines, and then apply curvature in a manner similar to the method suggested on page 395 of the Third Edition of Petroleum Refinery Engineering (McGraw-Hill Book Co., Inc., New York, 1949).

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8. Geddes, R. L., A.S.T.M. versus T.B.P., Ind. Eng. Chem., 33, 795 (1941).
9. Nelson, W. L., Hempel versus T.B.P., The Oil and Gas Journal, September 1, 1952, p. 117.

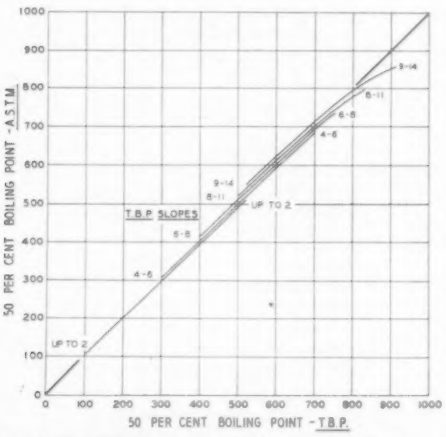


Fig. 2—Relationship between the 50 per cent boiling points of nonfractionating distillations (A.S.T.M., Saybolt, 10 per cent) and the 50 per cent boiling points of T.B.P. curves.

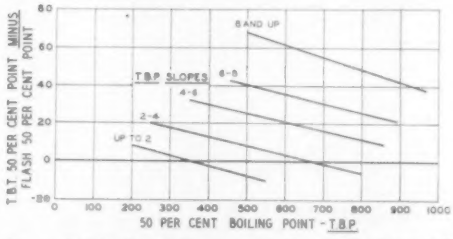
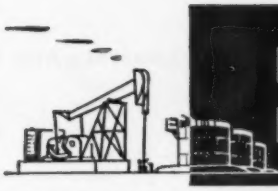


Fig. 3—Relationship of 50 per cent boiling points of true boiling point and flash vaporization curves.

by
Ralph F. Nielsen*



ENGINEERING FUNDAMENTALS

Electric Models for Study of Reservoir Performance

IN the latest two numbers of this series some simple electric models were described for steady-state flow in porous media and for unsteady state flow of a compressible liquid. In an actual analysis of the performance of a field by electric models it may be desirable to combine more than one type of model. A pool may, for instance, be driven by a gas cap and a water drive. In that case resistances to flow, and the expansion of oil, gas, and water may all have to be considered.

The use of electric models where these factors must be considered may perhaps be best illustrated by a hypothetical case. Consider a closed structure as shown in Fig. 1. The original dimensions and well arrangement are as shown. Other values are: water viscosity 1 cp., oil viscosity 5 cp., effective permeability uniform at 150 md., porosity 15 per cent, compressibility coefficients for the oil and water, respective, 6×10^{-6} and 3×10^{-6} per psi.

The relation between the electrical and fluid units must be decided upon. If 10 psi. corresponds to 1 volt we may write:

$$E/p = 1/10 \qquad (1)$$

where:
E = voltage
p = pressure in psi.

Also if 20 bbl. of liquid volume change per psi. corresponds to 1 μf. (1 microcoulomb per volt) then:

$$C_E/C_F = 1/20 \qquad (2)$$

and

$$C_F = V\psi c \qquad (3)$$

where:
C_E = capacities in microfarads
V = sand volume in barrels represented by a microfarad
ψ = fractional porosity
c = compressibility coefficient

To set up a relation between electrical resistance R_E and resistance to fluid flow R_F, we may write:

$$R_E/R_F = 3 \qquad (4)$$

where:
R_E = megohms
R_F = defined for radial flow by the formula

$$R_F = \frac{\mu \ln (r_2/r_1)}{2\pi kh} \qquad (5)$$

where:
μ = viscosity in cp.
h = sand thickness in ft.
r_1 and r_2 = two concentric radii
k = permeability in perms (1 perm = 1.127 darcies) or bbl. per day per sq. ft. per psi. per ft.

For linear flow:

$$R_F = \mu L/k A \qquad (6)$$

where:
A = cross-sectional area perpendicular to the flow
L = length in the direction of flow.

It remains to find the time and flow scales established by the above numerical ratios. Unit R_F will allow a flow of 1 bbl. per day per psi. pressure drop, or 10 bbl. for 10 psi., which corresponds to 1 volt. One volt across 3 megohms (equivalent of unit R_F) gives $\frac{1}{3}$ μa., whence 1 μa. = 30 bbl. per day. One microampere will discharge a 1-μf. condenser, previously charged to 1 volt, in 1 second. A flow of 30 bbl. per day (1 μa.) will flow the corresponding volume of oil (200 bbl.) in 6.66 days, so that 1 second on the model corresponds to 6.66 days.

The gas cap requires a model slightly different from those previously described. If the supercompressibility factor can be regarded as constant, the pressure is inversely proportional to the volume during isothermal expansion. That is, for a quantity of electricity i dt (i in microamperes, t in seconds) leaving the gas-cap unit, the cap has moved oil in the amount 30 i dt, where the numerical values of i and t given by the model are barrels and days for the formation. This is on the assumption of complete segregation and uniform pressure throughout the cap. The pressure is then reduced in the ratio $(\psi V_g - 30\ i\ dt)/\psi V_g$ where V_g is the original bulk volume of the cap. A device for changing the potential in accordance with the integrated current may therefore be used. The point of attachment to the oil-pool model would have to be moved according to the fluid moved and the change in the shape of the interface.

An arrangement to represent the reservoir of Fig. 1 might look something like Fig. 2. If the water unit is divided into five "slices," the capacitance representing the first slice is $C_E = \frac{5{,}000 \times 100 \times 39{,}000 \times 0.15 \times 3 \times 10^{-6}}{20 \times 5.62}$ = 78 μf. The electrical resistance is given by $R_E = \frac{1 \times 1.127 \times 5{,}000}{0.150 \times 100 \times 39{,}000} =$ 0.0096 megohm. Similar expressions apply to successive slices except for progressively lower values substituted for 39,000.

The oil pool may be represented by a sheet of metal foil or solution of the required resistance, with "wells" properly placed. Contacts from the gas cap and water-drive units would have to be made along equipotential lines, and condensers placed to allow for compressibility. It is simpler, but not so accurate, to divide the pool into "blocks" and represent them by resistors and condensers. If it is divided into eight blocks, the model would appear like Fig. 2. The resistance nearest the "wells" are given by Equation 5, where r_1 is the well radius and r_2 is somewhat arbitrarily taken in the neighborhood of 100. The potential E_g is furnished from the gas cap according to the relations already mentioned.

Let it be assumed that the original pressure was uniform at 3,000 psi. It is desired to find the change in pressure distribution with time if 150 bbl. of reservoir oil per day are withdrawn from Well 1 and 180 bbl. per day from Well 2. The model is charged to 300 volts, 5 μa. are drawn from Well 1 and 6 from Well 2, and the changes in potential noted. These should be fair indications for the early stages of this production.

Drastic changes in the model would have to be made periodically as the expanding water and gas invaded the oil zone, and especially as gas comes out of solution, altering the saturation, compressibilities and effective permeabilities.

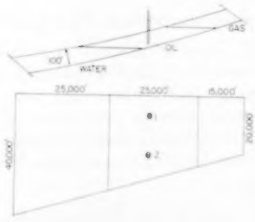


Fig. 1 — Water, oil, and gas in a closed reservoir.

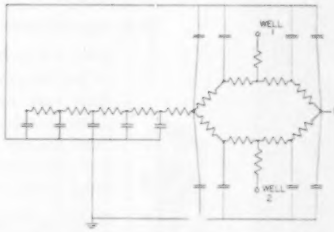


Fig. 2—Model for study of early production behavior of pool shown in Fig. 1.

*Associate professor, petroleum and natural-gas engineering, Pennsylvania State College.

Reference

Bruce, W. A., A.I.M.E. Trans. 1942-43, p. 318.

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302B	309Cb	317	347	430
304	310	321	403	443
308	314	329	405	446
309	316	INCONEL * — NICHROME **		

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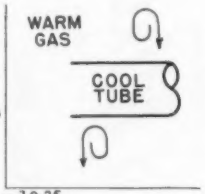
Part 28 of a series

by Dr. B. E. Lauer, Head, Department of Chemical Engineering, University of Colorado

h_f HEAT TRANSFER

COEFFICIENT of HEAT TRANSFER through FILM between OUTSIDE SURFACE of a COOL TUBE and a WARM GAS



Tube Position: Horizontal

Gas Movement: Natural Convection

Special Consideration: Cylinder of small diameter.

EQUATION:

$$h_f = 0.53 \frac{k}{D_o}\left[\frac{D_o^3 \rho^2 \beta g \Delta t}{\mu^2} \cdot \frac{c\mu}{k}\right]^{0.25}$$

TERMINOLOGY:

- h_f - Film coefficient of heat transfer, BTU/hr.sq.ft.°F.
- k - Thermal conductivity of gas at t_f, BTU/hr. ft. °F.
- D_o - Outside diameter of tube, ft.
- g - Acceleration due to gravity, 4.17×10^8 ft./hr.^{2}
- c - Specific heat of gas at constant pressure, BTU/lb. °F.
- ρ - Density of gas at t_f, lbs./cu. ft.
- μ - Viscosity of gas at t_f, lbs./hr. ft.
- β - Coefficient of volumetric expansion; for perfect gas $\beta = 1/°R$ (cu. ft./cu. ft.)/°F.
- Δt - Temperature difference between tube surface and ambient gas, °F.
- t_f - Temperature of gas film, °F., $t_f = (t_s + t_b)/2$ where t_s is temperature of tube surface and t_b is temperature of ambient gas.

LIMITATIONS:

Cannot be used for forced convection. The term in the brackets must be between (10^3 - 10^9). Most suitable for wires or for small cylinders.

SIMPLIFIED EQUATION:

For air $$h_f = 0.27 \left[\frac{\Delta t}{D_o}\right]^{0.25}$$

SOURCES OF DATA:

For physical constants for use in above equation see Chemical Engineers' Handbook - J. H. Perry (1948).

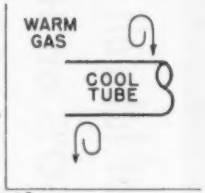
for ρ -- see pp. 130-148, 175-195, 1563.
μ -- see pp. 370-374, 1198, 1696.
k -- see pp. 459-461, 1303, 1697.
c -- see pp. 225-235, 297, 1588, 1696.
β -- see pp. 200-202, 1875.

REFERENCES:

1. Heat Transmission, 2nd Edition, W. H. McAdams, pp. 241-245 (1942).
2. Trans. Am. Inst. Elect. Engrs., C. W. Rice 42, (1923), pp. 653-675.
3. Introduction to Heat Transfer, Brown and Marco, p. 107.

J 1 a (1) (a)

COEFFICIENT of HEAT TRANSFER through FILM between OUTSIDE SURFACE of a COOL TUBE and a WARM GAS



Tube Position: Horizontal

Gas Movement: Natural Convection

Special Consideration: Cylinder of medium diameter (1 to 4 or 5 inches.)

EQUATION:

$$h_f = 0.47 \frac{k}{D_o}\left[\frac{D_o^3 \rho^2 \beta g \Delta t}{\mu^2 g} \cdot \frac{c\mu}{k}\right]^{0.25}$$

TERMINOLOGY:

- h_f - Film coefficient of heat transfer, BTU/hr.sq.ft.°F.
- k - Thermal conductivity of gas at t_f, BTU/hr. ft. °F.
- D_o - Outside diameter of tube, ft.
- g - Acceleration due to gravity, 4.17×10^8 ft./hr.^{2}
- c - Specific heat of gas at constant pressure, BTU/lb. °F.
- ρ - Density of gas at t_f, lbs./cu. ft.
- μ - Viscosity of gas at t_f, lbs./cu. ft.
- β - Coefficient of volumetric expansion; for perfect gas $\beta = 1/°R$ (cu. ft./cu. ft.)/°F.
- Δt - Temperature difference between tube surface and ambient gas, °F.
- t_f - Temperature of gas film, °F., $t_f = (t_s + t_b)/2$ where t_s is temperature of tube surface and t_b is temperature of ambient gas.

LIMITATIONS: For large cylinders (above, for example, one inch in diameter) where D_i and D_o are almost identical.

SIMPLIFIED EQUATION:

For air $$h_f = 0.27 \left[\frac{\Delta t}{D_o}\right]^{0.25}$$

SOURCES OF DATA: For physical constants for use in above equation see Chemical Engineers' Handbook - J. H. Perry (1948).

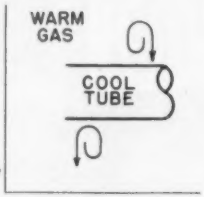
for ρ -- see pp. 130-148, 175-195, 1563.
μ -- see pp. 370-374, 1198, 1696.
k -- see pp. 459-461, 1303, 1697.
c -- see pp. 225-235, 297, 1588, 1696.
β -- see pp. 200-202, 1875.

REFERENCES:

1. Heat Transmission, 2nd Edition, W. H. McAdams, pp. 241-245 (1942).
2. Trans. Am. Inst. Elec. Engrs., 42, C. W. Rice, pp. 653-675 (1923).
3. Introduction to Heat Transfer, Brown and Marco, p. 107.
4. Industrial Heat Transfer, Schack, Goldschmidt, and Partridge, (1933).
5. Applied Heat Transmission, Herman J. Stoever, p. 59.

J 1 a (1) (b)

COEFFICIENT of HEAT TRANSFER through FILM between OUTSIDE SURFACE of a COOL TUBE and a WARM GAS



Tube Position: Horizontal

Gas Movement: Natural Convection.

Special Consideration: Cylinder of large diameter (above 6 to 8").

EQUATION:

$$h_f = 0.11 \frac{k}{D_o}\left[\frac{D_o^3 \rho^2 c \beta g \Delta t}{\mu k}\right]^{\frac{1}{3}}$$

TERMINOLOGY:

- h_f - Film coefficient of heat transfer, BTU/hr.sq.ft.°F.
- k - Thermal conductivity of gas, BTU/hr. ft.^{2} °F./ft., at t_f.
- D_o - Outside diameter of tube, ft.
- g - Acceleration of gravity. 4.17×10^8 ft./hr.^{2}
- β - Coefficient of volumetric expansion; for perfect gas $\beta = 1/°R$ (cu. ft./cu. ft.)/°F.
- Δt - Temperature difference between tube surface and ambient gas, °F.
- ρ - Density of gas at t_f, lbs./cu. ft.
- μ - Viscosity of gas at t_f, lbs./hr.ft.
- c - Specific heat of gas at constant pressure, BTU/lb. °F.
- t_f - Temperature of gas film, °F.; $t_f = (t_s + t_b)/2$.

LIMITATIONS:

When $(D^3\rho^2 c\beta g \Delta t/\mu k)$ is greater than 10^9.

For large cylinders above 6 to 8".

SOURCES OF DATA:

For physical constants for use in above equation see Chemical Engineers' Handbook - J. H. Perry (1948).

for ρ-- see pp. 130-148, 175-195, 1563.
μ-- see pp. 370-374, 1198, 1696.
β-- see p. 200-202.
k-- see pp. 459-461, 1303, 1697.
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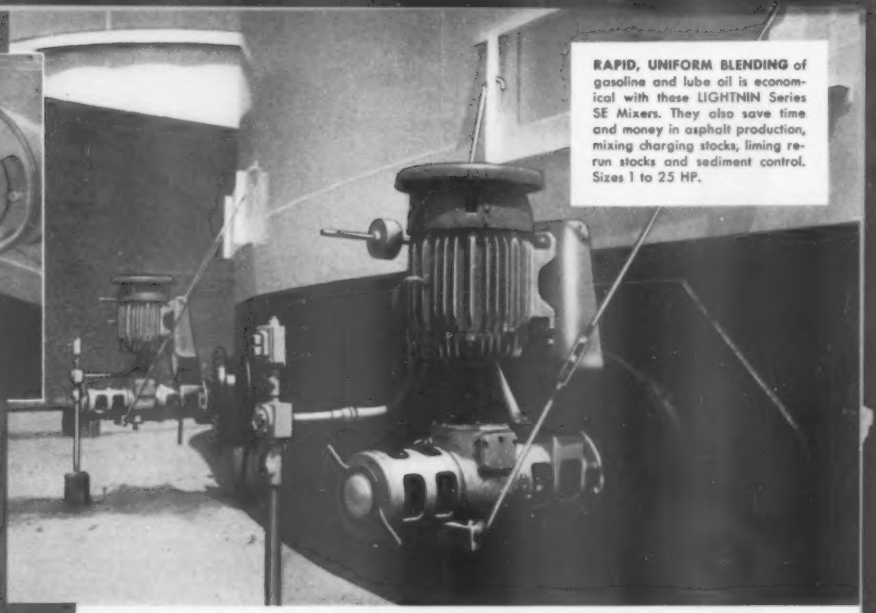
REFERENCES:

1. Heat Transmission, 2nd Edition, W. H. McAdams, pp. 241-245 (1942).
2. Introduction to Heat Transfer, Brown and Marco, p. 114.
3. Applied Heat Transmission, Herman J. Stoever, p. 59.

J 1 a (1) (c)



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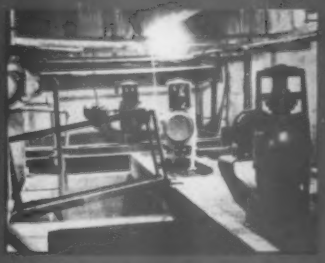

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HEATING-TUBE FAILURES—3

Case Histories

by J. J. B. Rutherford*

THE author has had numerous opportunities to examine heater tubes removed from service during furnace alterations or failure of some other component of the furnace. These case histories provide an excellent study and are a guide to what may be expected in the absence of unusual variations.

Representative causes of failure will be described here, with enough background evidence to help prevent recurrence. These clinical cases have been collected over many years and it has been observed that the earlier cases of flagrant overheating have given way to the more prevalent failure from chemical change—either corrosion wastage or change in the metal composition. The high production demands of the past few years have been quite severe on equipment. The furnace operator naturally tries to get maximum production, possibly to the extent of gambling on continued functioning.

*Babcock & Wilcox Co., tubular products division. From paper presented at John Zink Process Heating Seminar, Tulsa.

Examination Prior to Failure

An excellent case was submitted earlier by this author,[1] of a 5-in. by ⅝-in. wall still tube, 2 per cent Cr, ½ per cent Mo, after 11 years' service carrying oil at 1,000-psi. pressure, at 1,020° F. During that time, from ⅛-in. to ¼-in. thickness was lost from the wall, mainly as a result of mechanical cleaning. Turbining to remove coke abrades particles of metal and, under extreme conditions, can cut through the wall. This tube had excellent ductility and was in every respect suitable for continued extended service. However, it was approaching the point where bulging could be expected because of wall thinning; to prevent this, it would be necessary to reduce the temperature or pressure of the operation.

A tube sample, after 85,000 hours' service in a Houdry cracking unit heater, was submitted for routine laboratory examination to determine

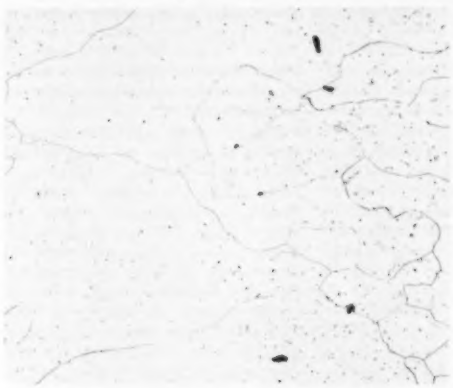


Fig. 1—Large grain structure at surface of tube.

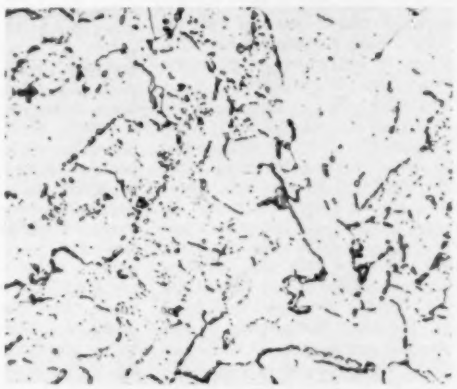


Fig. 2—Structure of Croloy 2¼ tube after 73,000 hours' service.

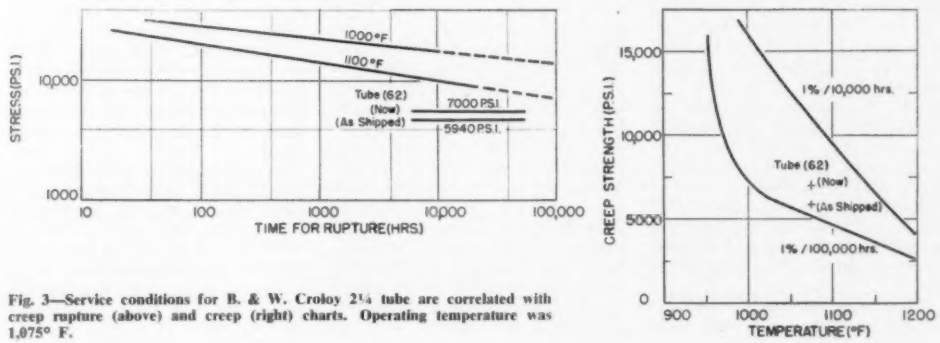


Fig. 3—Service conditions for B. & W. Croloy 2¼ tube are correlated with creep rupture (above) and creep (right) charts. Operating temperature was 1,075° F.

whether it was suitable for further service at 750° to 800° F. The wall thickness was reduced from a nominal .375 in. to .220 in. and there is evidence of some localized pitting at the inside surface which reduced the wall thickness by another .30 in. in these areas. This tube, with the exception of wall thickness, met all the requirements of the original specification and exhibited no change on metallographic examination; since service involved low pressure, the tube could continue to a calculated life.

Another carbon-steel tube was submitted for routine examination after 5 years' service in a heater. This material was found to be Rockwell hardness B 40-45, by comparison with the hardness B 60-75 generally found in a hot rolled tube. Metallographic study showed a very coarse grain structure (Fig. 1), at the outer surface which apparently is the result of cold work followed by heating in the range 850° to 1,000° F. It is believed that this tube has been hammered periodically to remove scale for inspection of diameter, and that the affected areas yielded pronounced grain growth. In this case, the tube appeared to be sound and good for extended service, yet the properties had changed to such an extent that a considerable risk existed in continuing at the same temperature and pressure.

In maintenance of some polyform unit furnaces, samples of Croloy 2¼ (which is 2¼ per cent chromium, 1 per cent molybdenum) were submitted for examination. These tubes had been removed either for corrosion-wastage at the ends or collapse at the ends by coke depositing in the tube seat. The tube described here had been in service 73,000 hours, heating oil to 920° F. at 1,400 psi. The metal temperature in this tube was estimated to be 1,010° F. Fig. 2 represents the structure observed in this tube, which is similar to the original, so no pronounced change had occurred. This coincided with the fact that tensile properties were typical of the original annealed tube. Fig. 3 is plotted from the stress rupture properties of this steel. At 1,075° F. failure will occur in 75,000 hours (the life of this tube) at a fiber stress of 10,000 psi. The original tube obtained a fiber stress under 6,000 psi., which, because of wall thinning, has increased to 7,000 psi. It is obvious that this tube can be built up at the ends and continue safely in service for a calculated period.

Tubes from a heater furnace in a refinery delayed coking unit were removed during overhaul, because of excessive distortion after 20,000 hours, and were studied to determine suitability for continued service. These were Croloy 9 (which is 9 per cent chromium 1 per cent molybdenum), 3¼-in. by ⅜-in. coking coils with oil temperatures of 690° F. inlet to 915° F. outlet, and pressure 400 psig. inlet to 40 psig. outlet. Metal temperature was allowed to build up to 1,300° F., at which time thermal decoking was practiced. Since these tubes were subjected to radiant heating, it was recognized that, locally, temperatures above 1,300° F. may be attained. A cross-section of the tubes showed a pronounced carburized layer, about .040 to .070 in. deep, at the inside surface. A section of this tube was squeezed in a press and cracked through the wall with little or no deformation (see Fig. 4.) However, when a similar sample was heated, to about 1,300° F. and flattened, it exhibited an ability to deform, Fig. 5, which might be compared to the original metal. Here, then, were tubes which seemed satisfactory on casual inspection, but which were glass-hard and would never have withstood the straightening operation necessary before reinstalling in the furnace. With the precaution of heating prior to working, these tubes could continue to give useful service.

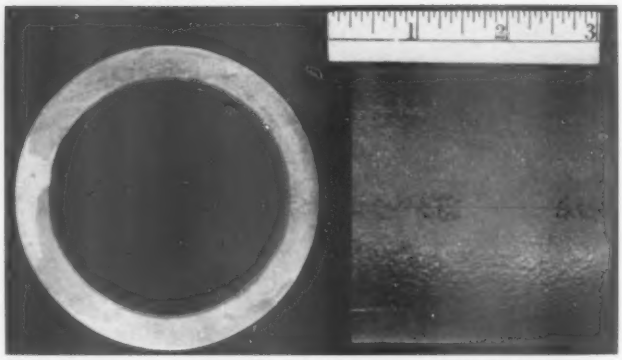


Fig. 4—Sample of Croloy 9 tube which cracked through wall with little or no deformation.

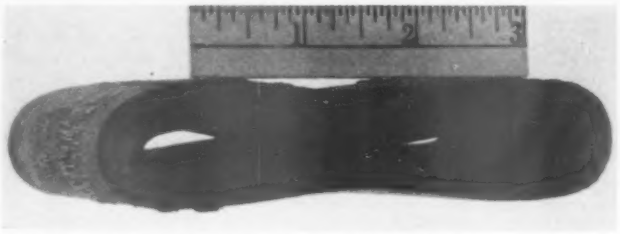


Fig. 5—Similar sample to that of Fig. 4 showed ability to deform after heating.

Failures from mechanical causes will be covered in the next installment. Failures of tubes will be covered which are ruptures resulting from the localization of stresses. At high temperatures the distribution of stresses is different primarily because of the phenomenon of relaxation. A notch-type defect which would result in low ductility to rupture at ordinary temperatures, may have no such effect if stresses are dissipated and the bottom of the notch rounds out. The transition from ductile to brittle impact tests at subzero temperatures is well recognized in ordinary steel. Similar transitions occur with other properties and other steels at higher temperatures. Experience alone can detect which features will generate a stress raiser at elevated temperatures.

Examples will be given of tubing weld failures, cases of stress corrosion fatigue and failures due to local overheating.

Reference

1. High Temperature Properties of Metals. American Society for Metals, Cleveland, 1951.

by Marshall E. Parker*

CORROSION CONTROL

Does Cathodic Protection Constitute a Fire Hazard?—2

DISCUSSION of the fire hazards associated with cathodic protection was initiated in the last installment of Corrosion Control. Hazards associated with the rectifier and with insulated joints in pipe lines, and correction of these hazards were taken up at that time.

Two other possible hazards remain to be examined. Just as it is possible to obtain a dangerous arc by interrupting the continuity of a protected pipe line, so is it possible to obtain one by breaking or cutting one of the cathodic protection cables. A number of precautions may be taken to preclude this possibility.

In the first place, the location of all buried cables should be accurately known and clearly marked. No excavation should be allowed in the vicinity of these cables without the knowledge and cooperation of someone familiar with the system. Sometimes it may be deemed advisable to shut down the cathodic protection system for a time, but it should never be assumed that shutting down the system will completely eliminate the danger of an arc, either in the cables or in the pipe itself. A back voltage exists between a structure which has been under protection and the anode which has been furnishing the current, and current can flow which may amount to 10 or 15 per cent of the normal operating current.

One technique which has been used to minimize the danger of cutting buried cables, particularly with hand tools, is that of pouring a layer of colored concrete over the cable before burial. This is designed to call attention to the existence of something which requires explanation, at the very least; the concrete will also resist hand tools adequately.

If it is possible, without too much extra cost or too much interference with other facilities, the cathodic-protection cables may be installed aboveground. This is also advantageous from the standpoint of the protection system, since the cables are not subject to the damaging effects of current discharge in case the insulation is less than perfect, as they are when buried. Cables aboveground need not be insulated, or may have a much less expensive grade or type of insulation than those designed for direct burial.

Mention has been made of the lightning hazard, not so much in connection with cathodic protection as such as in connection with the insulated joints which are usually required. Current surges in pipe lines may reach very large values, even when the lightning stroke does not contact the line at all. The collapse of the magnetic field following the stroke induces the current in the line which lies in the field.

These surges travel along the pipe line in the form of a steep-front wave, the attenuation being governed by the resistance of the pipe, the conductance of the coating, and the resistivity of the soil. In general, the better coating on the line, and the higher the resistivity of the soil, the greater the distance over which such a wave may travel before it is dissipated.

System Maintenance

This steep-front wave has, in common with lightning effects in general, a great reluctance to go around corners. Upon encountering an insulated joint, the surge will often perforate one of the washers, or even the gasket itself, and, in so doing, sometimes welds the metal together through the perforation. It is difficult to see that such an occurrence presents very much of a fire hazard, and it is doubtful if a fire has ever been so caused. It does, however, cause considerable difficulty with the maintenance of the cathodic-protection system, for the welding action effectively short-circuits the insulation, and in a manner which is particularly difficult to repair.

This effect has been combated by the use of a special perforated washer, installed in one of the more accessible locations, so that it may be replaced when damaged. Another approach is to bring a pair of leads up, one from each side of the joint, and connect them to lugs which are bolted together with a perforated mica disk between them. This separation being less than any in the joint itself, the arcing is supposed to take place here. The reluctance of steep-front waves to go around corners, however, means that sometimes the longer gap at the flange will be jumped instead. Accordingly, it is advisable to use one of the perforated washers also.

Safety Features

It is felt, then, that cathodic protection and the insulation which is necessary in conjunction with it, offer no fire hazard which cannot be overcome by careful design and reasonable operating precautions. The design features recommended are: (1) Bond **all** the underground piping within an area together and protect it as a unit; (2) bond all pipes entering any valve box or pit with a permanent connection circling the pit; (3) install insulated joints only at locations where their accidental short-circuiting would not be hazardous, or protect them effectively against accidental contacts; and (4) install current-carrying cables where they can be protected against accidental breakage.

Operating procedures recommended are: (1) Never cut or otherwise interrupt the continuity of any pipe which carries a possibly flammable fluid, or which lies in an area where vapor may be present, without first installing an adequate bond; (2) never cut a cable without knowing that it is safe to do so; (3) allow no excavation in the vicinity of a cathodic protection system without the knowledge and cooperation of someone familiar with the system.

*Consulting engineer, Houston.

EQUIPMENT MEN . . . in the News

Three Branch Offices Opened By Ansul Chemical Co.

ARMSTRONG

To provide better fire-protection service to the petroleum industry of the Southwest, Ansul Chemical Co., Marinette, Wis., manufacturers of dry-chemical fire-extinguishing equipment, is opening new branch offices in the Houston, Dallas-Fort Worth, and Tulsa areas.

Visiting these cities in connection with the opening of the offices, Robert C. Hood, Ansul president, said that although millions of dollars worth of his company's dry-chemical extinguishers are already being used in oil fields, gas lines, and construction jobs in the area, the market has only been scratched.

District sales will be supervised by C. H. Armstrong. Thomas Gorman will be technical service representative, stationed at Kansas City. Virgil Murry will manage the Houston office; Neal Engberg will manage the Dallas-Fort Worth office, and Roger Allen will manage the Tulsa office. Warehouses will be maintained in Houston and at Kansas City, handling the company's line of industrial chemicals as well as fire equipment.

T. GORMAN

VIRGIL MURRY

N. ENGBERG

ROGER ALLEN

Among successful achievements of dry chemical is the recent extinguishment in 50 seconds of an oil-well fire in Las Mercedes field of The Texas Co. Previous to being extinguished by dry chemical, the fire had burned for 5 days.

J. C. Riley Co. Reactivated

John C. Riley has activated his original firm, J. C. Riley Co., 2438 South Boulevard, Houston. This company will serve as factory representative in the Southwest for The C. M. Kemp Manufacturing Co., manufacturers of inert-gas generators, carburetors, immersion heaters; Reading Crane & Hoist Corp., overhead hand and electric hoists and cranes; International Engineering, Inc., mixers, agitators, process equipment, and Midwest Alloys, Inc., alloy castings, flanges, and fittings.

Bozeman Is President Under Tuboscope Reorganization

J. W. BOZEMAN

New officers for Tuboscope Co. have been announced following a recent reorganization of the company.

J. W. Bozeman has been named president of Tuboscope, and other company officers are B. H. Pickard and Harry Bozeman, vice presidents, and H. E. Berry, secretary-treasurer.

The policies of the company will not be affected in any way by the new

Bovaird Retirement Plan Explained at Sales Meet

Bovaird Supply Co. officers attending recent annual sales meeting were, seated: D. D. Bovaird, president. Standing: Frank D. Bovaird, vice president; Roscoe G. Ayers, vice president and general manager of sales; Raymond E. Batchelor, general manager of stores; T. H. Trower, treasurer; R. M. McMahan, secretary and purchasing agent; and W. J. (Bill) Bovaird, assistant to the general manager of stores.

One of the outstanding features of the recent annual sales and management meeting of Bovaird Supply Co. at Tulsa was the explanation of the recently adopted retirement plan which contains many unusual features to provide substantial benefits to employes for past and future service.

Davis D. Bovaird, president, stated that the meeting was one of the most successful in the company's history. Sales and management personnel reviewed the past and surveyed the future outlook. Roscoe G. Ayers, vice president and general sales manager, coordinated the meetings. Other officers participating in the 3-day meeting were Frank D. Bovaird, vice president; R. M. McMahan, secretary and purchasing agent; Raymond E. Batchelor, general manager of stores; T. H. Trower, treasurer, and W. J. (Bill) Bovaird, assistant to the general manager of stores.

Attending the meeting were all of the company's district managers, store managers, city sales representatives, department heads, and other key personnel from its 22 offices and stores in Illinois, Kansas, New Mexico, Oklahoma, and Texas.

setup, said Bozeman. Tuboscope will continue to provide specialized tubular inspection services both above and below surface and will continue its research in the development of better inspection methods.

Mid-Continent Supply Names Managerial Promotions

D. L. JOHNSTON

Ken W. Davis, president of Mid-Continent Supply Co., Fort Worth, recently announced the following promotions: D. L. Johnston, Mid-Continent district manager of diesel sales and service in Shreveport, has been promoted to Shreveport division machinery manager; F. L. Martin has been named manager of the company's store in Oklahoma City, and E. H. Keeter, former field salesman for Mid-Continent in San Angelo, Tex., has assumed new duties as manager of the company's store in Gainesville, Tex.

F. L. MARTIN

E. H. KEETER

Johnston has been with Mid-Continent since 1943. He worked in Fort Worth and Houston before transferring to Shreveport in 1946. Before coming to work for Mid-Continent, Johnston worked in an engine sales and service organization, and as an engineer with an ordnance company.

Martin is former assistant store manager for Mid-Continent at Oklahoma City, and has worked for the company since 1950. Prior to that time he was employed by Greenhead, which Mid-Continent purchased, in Oklahoma City.

Keeter has been with the company for 6 years, working at Odessa and Rankin, Tex., before serving at San Angelo.

Cardinal Moves Smith

Mike Smith, junior engineer for Cardinal Chemical, Inc., has been transferred from Odessa to Levelland, Tex., and promoted to service engineer.

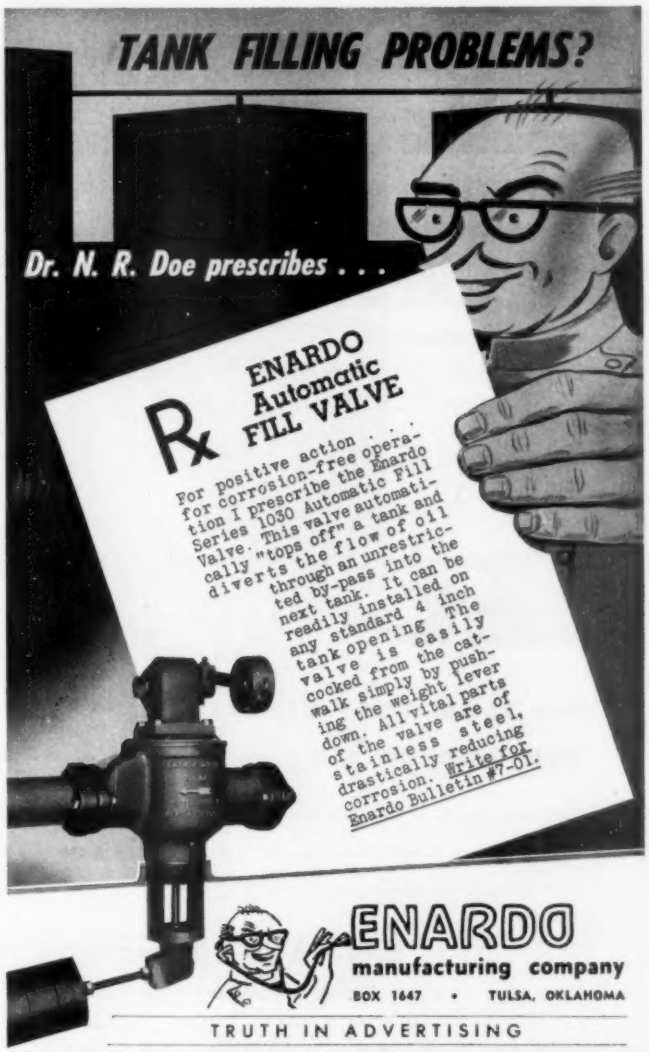
Coates Field Service Announces Company Changes

Graham V. Taggart, vice president of Coates Field Service, Inc., Oklahoma City, has announced company changes which have occurred since the first of the year.

Field offices have been opened in St. Cloud and Marshall, Minn., under the supervision of H. E. York, field superintendent. These offices were established to complete a project for Northern States Power Co., Minneapolis. A field office has been established in Storm Lake, Iowa, under the supervision of Gene L. Land, field superintendent, to complete a project for Iowa Public Service, Sioux City, Iowa.

A new firm, Field Transportation Co., was formed in Oklahoma City as a subsidiary of Coates Field Service, Inc. This company was organized to supply by contract the transportation and equipment needs of oil operators and contractors throughout the oil and gas industry, and the needs of its parent firm. This subsidiary is under the management of William M. Morris, Oklahoma City, with branch offices in Hutchinson, Kans., and Shreveport.

David E. Ray, assistant field superin-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TRUTH IN ADVERTISING

tendent for Coates Field Service in the Minnesota division, has been promoted to comptroller and transferred to the general offices in Oklahoma City.

Wolverine Tube Division Moves Dallas Sales Offices

Sales offices of the Wolverine Tube Division have been moved in Dallas from 309 Browder Street to 511 North Ervay Street. This move was announced recently by C. T. Fuller, Southwestern district sales manager for Wolverine Tube Division of Calumet & Hecla, Inc., from his Houston headquarters.

E. F. Bentley Appointed General Sales Manager

The appointment of Ernest F. Bentley as general sales manager of the Detroit Diesel Engine Division of General Motors has been announced by W. T. Crowe, general manager of the division. Bentley succeeds V. C. Genn, deceased.

Other appointments which have been announced by Bentley include Robert V. Baxley, as operations sales manager; John C. Campbell as manager of manufacturers' sales, and Louis A. Steele as industrial sales manager.

Bentley's association with General Motors dates from 1934 when he started as an engine designer with Win-

E. F. BENTLEY

R. V. BAXLEY

ton Engine Corp. of Cleveland, which later became the Cleveland Diesel Engine Division. He came to Detroit Diesel in 1940 as project engineer, and

J. C. CAMPBELL

L. A. STEELE

prior to his present appointment was operations sales manager. He also served as staff assistant to the general manager, production buyer, supervisor of control materials, and manager of manufacturers' sales.

Baxley, former contractors' equipment sales manager, started with General Motors as a sales engineer in 1939, and a year later joined Detroit Diesel as an experimental engineer. Campbell came to the division from Frigidaire in 1942, and has served as advertising and sales promotion manager and industrial sales manager. Steele has been with Detroit Diesel since 1942, serving as distribution manager, manager of the contract and order section, and automotive and tractor sales manager.

Foxboro Announces New Kansas Branch Office

The Foxboro Co., Foxboro, Mass., manufacturer of industrial instruments for measurement and control, has opened a new branch office at Wichita, Kans., to serve instrument users in the Kansas area.

Appointed resident engineer at Wichita is Dale G. Hugley, who moves to his new assignment after several years of service with the Tulsa branch as industrial engineer. Hugley is a graduate of Oklahoma A. & M. and has had extensive experience in the application of instruments in industry.

THE 100% CORE RECOVERY YOU PAID TO SEE

3,451 feet of core — the entire story of your well with no chapters missing. Diamonds mean faster, deeper penetration and greater core recovery. Your results — Less Cost Per Foot!

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DIAMOND PRODUCTS COMPANY

1937 South 2nd West · Salt Lake City, Utah

Bruse Made Branch Manager At Amarillo, Tex., for A-C

R. E. BRUSE

Ralph E. Bruse has been announced as branch manager at Amarillo, Tex., succeeding Charles W. Baker, retired, for the Tractor Division, Allis-Chalmers Manufacturing Co. The announcement was made by Frank Mussell, vice president, and general sales manager.

In his new position Bruse will supervise sales for the Tractor Division's complete line of products He has been with the Amarillo branch since 1949.

Alexander to Travel Latin America for Thermoid Co.

Thermoid Co., Trenton, N. J., has announced the appointment of Henry L. Alexander, Jr., as sales manager of the Thermoid Rubber Co., industrial division. In this capacity Alexander will travel Latin America for the company.

For the past year Alexander has been in Europe and the Middle East in the interests of Thermoid Co. Prior to that he had spent 17 years in Latin America in the employ of various United States interests, including Pan-American Airways, and the United States War Department.

Kunkel Made Los Angeles Sales Manager by ESCO

Scott Kunkel, staff chemical engineer for Electric Steel Foundry Co., has been appointed Los Angeles manager of sales. For the past 9 years Kunkel has specialized in handling Esco's technical, chemical, and petroleum accounts as well as rendering sales support to the Los Angeles staff in all other industries.

Kunkel is a graduate of University of California, and he has worked in both the chemical and petroleum industries of Southern California as a plant operator, chemist, and engineer.

Electric Steel Foundry Co. is a distributor of stainless-steel rolling-mill products, stainless-steel pipe, valves, and fittings as well as a producer of heat and corrosion-resistant coatings and specialty products.

Kilmer, Brauer Advanced by Golden-Anderson Valve

John H. Kilmer, Jr., has been appointed chief engineer, and Paul A. Brauer, assistant chief engineer in charge of production of Golden-Anderson Valve Specialty Co., Pittsburgh. Both Kilmer and Brauer have been associated with the company since 1938.

Name Change Announced by Midwest Piping & Supply

By vote of the stockholders at a meeting held in February, the name Midwest Piping & Supply Co., Inc., has been changed to Midwest Piping Co., Inc., according to an announcement by A. G. Stoughton, president and chairman of the board of directors.

Stoughton has reported that there has been no change in ownership, management, personnel, or activities of the company, and no changes are contemplated. The new name is intended more accurately to describe the company's operations.

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PIPELINE PIGS-

the standard for oil lines because they have

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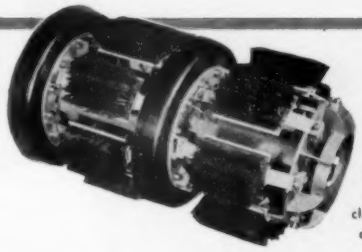

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WILLIAMSON PIG

The standard tool for Big-inch oil lines everywhere. Brushes are expanded by arched springs for efficient cleaning . . . Brush and cup have a service life up to 1,000 miles.

Send for descriptive folder showing uses of Williamson Pigs.

T. D. Williamson, Inc.

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CLEANS PIPE LINES

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JAMES S. KONE & CO. — AMARILLO, TEXAS
LANGLEY Y CIA. — BUENOS AIRES, ARGENTINA
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The fittings that revolutionized pipe welding . . .

In the year 1931 Taylor Forge gave industry its *first real line* of seamless, butt-welding pipe fittings. We say it was the first *real* line because it was the first to include not only long and short radius ells, but also full branch and reducing tees, concentric and eccentric reducers, stub ends, caps and welding neck flanges.

This was a fully planned development. Many years before Taylor Forge had foreseen the future of the butt-welding fitting . . . had realized that pipe welding could not go beyond its then crude stage until pipe users were given *all* the fittings necessary to make up complete piping systems.

So Taylor Forge went to work on this and after long research and development came out with the full line that became the inspiration of modern pipe welding.

Naturally the organization that started ahead has kept ahead . . . in design, in quality, in breadth of line. That is why so many men who have followed the development of the WeldELL line, refuse to consider any other kind of welding fittings.

T F

For up-to-the-minute facts, see your Taylor Forge distributor

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Offices in all principal cities. Plants at: Carnegie, Pa.; Fontana, Calif.; Hamilton, Ont., Canada

OIL AND GAS EQUIPMENT Digest

IT'S NEW — CHECK IT

TRADE LITERATURE

1 HIGH-CAPACITY TEXROPE V-BELTS for tough jobs are described in a new four-page bulletin. The belts are recommended for use in tight spots, for compactness, changed peak loads, resisting oil, weather and chemicals, cutting sheave costs, and where static is a factor. *Allis-Chalmers Manufacturing Co.*

2 1953 INSTRUMENT TRANSFORMER BUYER'S GUIDE contains basic, up-to-date information on the complete General Electric line. This illustrated 102-page publication gives ratings, A.S.A. accuracy classifications, and prices of all G-E indoor and outdoor potential, and current transformers. Listings of ratio and phase-angle tests, together with tables covering mechanical and thermal limits of current transformers, are included. *General Electric.*

3 AIR FOR POWER, ROSS FOR CONTROL, a 12-page illustrated booklet, explains characteristics and advantages of air power, and describes three fundamental types of air control valves. Colored diagrammatic drawings show clearly how air flows through the valves and to the operated cylinders. Also discusses advantages of each type, an explanation of how they work, and a list of available standard models. *Ross Operating Valve Co.*

4 PROOF THAT MEEHANITE BRIDGES THE GAP BETWEEN CAST IRON AND STEEL is a 20-page illustrated booklet devoted to a series of case histories showing how in recent months critical material shortages have been solved by the use of Meehanite castings. Also included are alphabetical tabulations showing specific replacements of alloyed irons and steel, brass, bronze, and forgings. *Meehanite Metal Corp.*

5 SEALASTIC ALL-PURPOSE FITTINGS. This two-color catalog describes fittings used to an advantage on fuel, oil, water, air, and refrigerant lines under a broad range of temperature and pressure conditions, complete with specifications and application photographs. *Chicago Forging & Manufacturing Co.*

6 INSTRUMENT MERCURY describes mercury meeting all purity requirements and dispensing and drop control tips for transferring mercury from container to instruments. *Bethlehem Apparatus Co., Inc.*

7 SIER-BATH FLEXIBLE GEAR COUPLINGS. Catalog C 4 discusses advantages of standard, mill motor, vertical shaft, floating shaft, and spacer-type couplings, as well as special types. Engineering data and views of typical applications are included. *The Sier-Bath Gear & Pump Co., Inc.*

8 FORT WORTH QD SHEAVE SPECIFICATION GUIDE gives dimensions and weights of QD V-belt sheaves and hubs. Construction features are described by cutaway photographs, and installation and removal instruc-

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tions are illustrated by pictorial panels. Tables and line drawings give complete hub and sheave dimensions. *Fort Worth Steel & Machinery Co.*

9 DEPENDABLE LUNKENHEIMER FIG. 2140, a multicolored brochure, describes and illustrates 125-lb.-pressure globe, angle, and check bronze valves. Large sectional views showing outstanding features, such as hexagonal head gland, stuffing box, body, repacking, bonnet, and disk, in complete detail are included. *The Lunkenheimer Co.*

10 USE AND APPLICATION OF POWER CRANES AND SHOVELS. This 32-page booklet contains a detailed discussion of basic principles of power shovel and crane operation. Aided by numerous photographs, drawings, graphs, and tables, the capabilities of various excavator and crane attachments are outlined along with prescribed requirements for efficient operation. *Koehring Co.*

11 NORDBERG FOUR-CYCLE SPARK-FIRED GAS ENGINES is a new four-page, two-color bulletin which describes design, construction, and operating features of these engines built in 9 and 13-in. bore sizes, and ranging from 265 to 4,260 hp. Bulletin discusses high thermal efficiency, and presents a heat-balance diagram of the Supairthermal spark-fired gas engine showing its efficiency in excess of 40 per cent. *Nordberg Manufacturing Co.*

12 ALCOA ALUMINUM PIPE AND FITTINGS is a 12-page, two-color brochure presented in question and answer form. The brochure provides pictorial answers to the questions: Where are aluminum pipe fittings used? Why is Alcoa aluminum pipe used? What are its chief applications? Explanations are given in detail on how aluminum pipe is installed, and various tables are included which give specifications for aluminum standard pipe. *Aluminum Co. of America.*

13 PLASTIC PIPE FOR THE PETROLEUM INDUSTRY illustrates five quick steps to easy plastic pipe installation on lead, flow, gathering, siphon, and salt-water-disposal lines, complete with specifications. *Crescent Plastics, Inc.*

14 IS TENSION CONTROL IMPORTANT IN YOUR MANUFACTURING? This colorful folder features an automatic and remote control Lod-Cap, small in size, to fit almost any manufacturing situation where tension measurement and/or control are involved. Lod-Cap capacities range from 0-1 lb. through 0-12,-000 lb. *Link Engineering Co.*

15 TUBING STEEL FOR ELEVATED TEMPERATURE AND PRESSURE APPLICATIONS. This new technical data card discusses Croloy 5 (4-6 per cent chromium, ½ per cent molybdenum) tubing steel used in elevated temperature service. Bulletin includes data on mechanical properties, creep strength, physical properties, welding, fabrication, and heat treatment. *Tubular Products Div., The Babcock & Wilcox Co.*

16 DIALIFT TANKS. Bulletin 53DL details the inherent values of these tanks used for new storage installations or as a conversion of existing cone-roof tanks. Bulletin also lists range sizes, illustrates construction, and describes its use as a single unit and as tied in with a battery of tanks. *Hammond Iron Works.*

17 PENN SAFETY CONTROLS FOR ENGINES. Bulletin E-100F describes and illustrates three basic models — combination pressure and temperature, oil pressure, and water temperature units, available for temperature control, and for protection of pressure-lubricated machines. Features of construction are discussed, together with selection guide, temperature element table, and price-list schedule. *Penn Controls, Inc.*

18 THE GENERAL MOTORS DIESEL ENGINE-TORQUE CONVERTER UNIT. This book is well illustrated with cutaway drawings, curves showing horsepower characteristics of engines so equipped, and photos of torque converter units at work in typical installations in the industrial, construction, and petroleum fields. *Detroit Diesel Engine Div., General Motors Corp.*

FOR MORE INFORMATION . . . . use one of these cards

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OIL AND GAS EQUIPMENT Digest

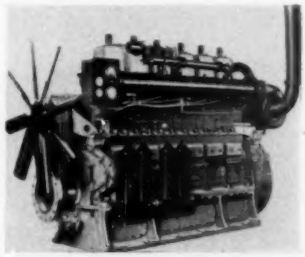
IT'S NEW CHECK IT

by Dan B. Miller

19 HEAVY-DUTY SPUDDER DERRICK. For ease in handling long strings of casing weighing up to 150 tons, a heavy-duty tripod-type derrick is now available as special equipment for the Bucyrus-Erie 48-L spudder. The 70-ft. 4-in. derrick is the first of its size and type designed especially for a spudder. It weighs 12 tons and is composed of four sections for easy erection, knockdown, and transportation in the field. The main front lower section is constructed with four laced channels. The crown block, a separate unit, supports six casing line sheaves. The two triangular legs are hinged to a special steel beam base for maximum stability. The base extends the length of the spudder base and derrick legs and is included with the derrick. It also is designed to be disassembled for moving. The derrick is assembled on the ground. The two rear legs are hinged to the base and the unit is pulled upright by a cable attached to the bull-reel drum and reeved over a gin pole which also is supplied with the derrick. The special heavy-duty derrick is available with new machines with the standard derrick omitted or may be ordered as a separate unit for 48-L's in the field. *Bucyrus-Erie Co.*

IT'S NEW CHECK IT

20 NEW TURBOCHARGED DIESEL ENGINES. Five engine sizes: 426, 779, 1,197, 1,905, and 2,894 cu. in. displacement, are currently being produced as turbocharged units. Incorporation of turbochargers has produced substantial power increases and greater fuel economy. Three of these engines are for transportation or industrial service and the two largest are complete power units for industrial service. The 1,197-cu.-in. model is supplied either as a bare engine or complete unit. The turbocharged ratings represent power gains from 147 to 185, 200 to 280, 225 to 352, 298 to 380, and 406 to 570 hp., respectively. All of the engines are heavy-duty, six-cylinder, four-stroke-cycle units. Turbochargers are of two designs, the Schwitzer-Cummings turbo being used on the Model 135-DKBS, and the Elliott turbo as standard equipment on the four larger models. On the three smallest engines the turbo is ordinarily top-mounted on the exhaust manifold. On the two large industrial units the turbo is mounted on the rear end of the exhaust manifolds. At top engine speeds, the rotating elements of these turbochargers turn at a speed that may be as high as 35,000 to 40,000 r.p.m. Model LRDS with 2,894 cu. in. displacement and 570 hp. is illustrated. *Waukesha Motor Co.*



IT'S NEW CHECK IT

21 ENARDO SERIES 300 SAFETY GAGING HATCH gives positive protection against hydrogen sulfide and other harmful fumes and speeds up the entire gaging operation. This device, which mounts conveniently near the walkway, consists of a gage opening, a vent pipe, and a simple swing check valve operated by a foot lever through an adjustable bar and linkage. The gager merely opens the gaging lid, passes the plumb bob and tape in far enough to close the lid, then presses the foot pedal to open the valve and allow the plumb bob and tape to pass down into the tank. While the valve is open the toxic gases escape safely through the vent pipe above the gager's head. In withdrawing the tape, the procedure is just the opposite, thus protecting the operator at

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

Keep Informed. Save Time. Tear Out Card. Check It. Mail It.

available in sizes to fit shaft diameters of ¼, ⅜, ½, ⅝, and ¾ in. *Crane Packing Co.*

IT'S NEW CHECK IT

27 AIR VAN, designed around the recently introduced Fageol Van Truck, the unit is a compact and efficient compressor truck assembly. The Van provides approximately 200 more cubic feet of payload space than trucks of similar length and wheelbase. Consequently, the Davey compressor occupies only about one-quarter of the truck body space, leaving the remainder available for the transportation of men, tools, and materials. Air Vans are offered with a choice of either 105 or 160 cu. ft. per minute standard Davey "Auto-Air" compressors. These are driven directly from the truck engine through a Davey heavy-duty power takeoff installed in the truck driveshaft. Air Vans are especially suitable for use by contractors operating over extensive areas, and all operations in which a high degree of compressor portability is essential. *Twin Coach Co.; Davey Compressor Co.*

IT'S NEW CHECK IT

28 NEW HINGE-GUARD LOAD PROTECTORS are ideal in transporting steel coils, sheets, pipe, tubing, lumber, clay products, and machinery, and aid in protective unloading as well. Any chain or cable contact with the load is prevented. Also allows increased chain tension making loads more compact, less likely to shift. Two pieces hinge-lock together to make the unit which will angle from 90° to 180°, can be used singly by simply lifting the two pieces apart. They accommodate chain or cable up to and including ½ in. and if grab hook is already secured to chain, it will thread through the unit. *Canton Manufacturing Co.*

IT'S NEW CHECK IT

29 HYDROJIB PIPE-LINE DRILLING RIG, a self-contained unit for drilling blast holes on either right-of-way or ditch work, carries two Joy 3½-in. rock drills on 6-ft. chain-type feeds, mounted on 10-ft. hydraulically actuated Joy Hydro Drill Jibs. It maintains its own compressed air supply through a Joy WL-80 air compressor mounted on the rear of the tractor and driven through power takeoff. Air receivers are built into the rig. All the necessary equipment can be mounted on a tractor. *Joy Manufacturing. Co.*

IT'S NEW CHECK IT

30 MODEL 4140 WASHINGTON MOVING BLOCK of 30-ton capacity, designed with manganese sheave, cast-steel sides, and bronze bushings for extra strength and economy. Moving blocks, cat blocks, rigging blocks, snatch blocks and hoisting blocks are among the principal types supplied by the firm for heavy moving, construction, and oil-field operations. *Washington Iron Works.*

IT'S NEW CHECK IT

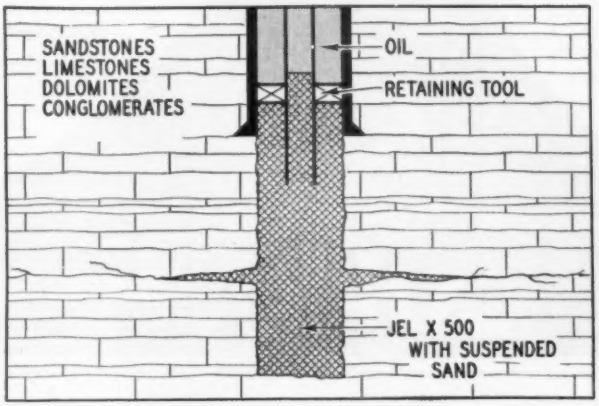
31 ELECTRIC CIRCULATION HEATER. Diesel engines used in cranes, trucks, and other equipment used outdoors can be kept ready to operate in the coldest weather safely and automatically with electric heat. A few kilowatt hours of electricity can save many man and equipment-hours ordinarily lost in waiting for engines to warm up. These heaters are attached to the engine block with angle iron. With flexible connections to the cooling system, regular types of anti-freeze are circulated by natural convection through the heater and engine block, warming the engine in a short time. Special pumps are not required. The photo shows one of the heaters attached to a crane engine. The Chromalox electric circulation heater is a completely packaged unit with built-in elements, heating chamber, thermostat, and threaded inlet and outlet. On average winter mornings, a 150° F. setting is sufficient to heat most engines in a half hour. In colder weather the heaters may be run all night at 90° F. *Edwin L. Wiegand Co.*

IT'S NEW CHECK IT

32 NEW PURGE ROTAMETER is designed for use where small, low-cost flow meters are needed to indicate and manually control small flows of fluids with good reproducibility but moderate actual measuring accuracy. Typical applications include the indication of: flow of supply air in bubbler-type liquid-level measuring installations; flow of purge fluid in the pipe lines connecting orifices, venturi tubes, or nozzles to differential head flow meters; flow of transparent purge fluid to sight-glass indicators; flow of purge fluid to indicator extensions or to extension wells with electric or pneumatic transmitters where the process fluid carries slurries, tends to settle out crystals, or may form surface coatings; flow of sample fluid to measuring installations for continuous chemical analysis of fluids. *Schutte & Koerting Co.*

PRODUCTION INCREASED 26 BOPD WITH DOWELL STRATAFRAC

New Dowell Service Combines Advantages of Acidizing and Fracturing in Single Treatment



This well's initial production was 19 BOPD. While the well had not declined, it was not considered good for its location. After various other remedial methods had failed, a Dowell Stratafrac treatment increased oil production to 45 BOPD. Payout time was estimated at 36 days.

Stratafrac treatments using Jel X 500 have increased production from all types of oil bearing formations—limestone, dolomite, sandstone, chat and conglomerate. This service is designed to fracture and acidize the formation in a single operation.

Stratafrac treatments carry suspended sand into existing fractures as an abrading and propping agent. They are also designed to remove paraffin or other heavy hydrocarbons present in the fractures or formation.

Stratafrac treatments are engineered to save you money by holding rig time to a minimum. All materials arrive at the well ready-mixed. No jel-breaker solution is needed following Stratafrac treatments, as the material returns to the well bore as a thin, free-flowing liquid. The well can be returned to production immediately without costly shut-in time.

GET THE FACTS ON STRATAFRAC! Find out how Stratafrac has increased production in many fields. For a more detailed discussion on this new Dowell service, call your nearest Dowell station or write direct to Tulsa, Dept. C11.

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Shape cutting Attachments for cutting the various shapes of pipe intersections.

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With the economical H&M you can save up to half of the time and labor in cutting and beveling pipe. This portable but durable machine makes a complete cut and bevel in a 12 inch pipe in about two minutes.

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NICOLET GLASS REINFORCED ASBESTOS PIPE LINE FELT

This Nicolet development is now available after months of intensive research and field testing. If you would like a sample of VITRABESTOS for close examination, write direct to Middle West Coating and Supply.

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PIPE LINES

Texaco Project

Gathering system planned in South Louisiana area

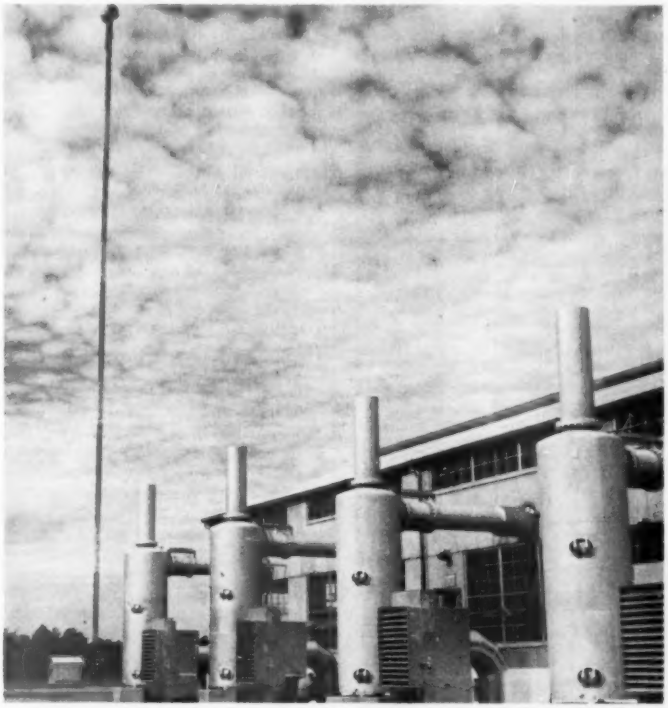
NEW ORLEANS.—Installation of extensive facilities to gather, compress, transport, and market natural gas produced in Terrebonne Bay and adjacent areas in South Louisiana has been started by The Texas Co., according to J. N. Troxell, general manager, Texaco's producing department, and J. H. Rambin, Jr., division manager, Louisiana producing department.

Included in the facilities is a gasoline plant at Paradis, St. Charles Parish, and a total of 111 miles of pipe lines for supplying natural-gas requirements of American Cyanamid Co. and Lion Oil Co. for large petrochemical plants in the New Orleans area.

The estimated 40,000,000 cu. ft. of gas required each day by these plants will be flare gas from Gulf Coast fields which hitherto has been a complete waste. Areas from which the gas will be produced include Caillou Island, Lake Barre, Leesville, Golden Meadow, Lake Pelto, Bay de Chene, and Bay Ste. Elaine in Terrebonne and Lafourche parishes.

Gathering system . . . Rights-of-way have been obtained by The Texas Co. and plans made to construct pipe lines, varying from 6 in. to 14 in. in diameter, which will extend 111 miles in linking up fields to the gasoline plant. Plans also provide for the installation of five compressor stations with a combined horsepower of 9,240, along the gathering system, the nucleus of which will be a 42-mile, 14-in. gas artery.

Two of the compressor stations will



Transco Installations at Linden, Ala.

Microwave tower, compressor exhausts, and air filters are pictured here at Transcontinental Pipe Line Corp.'s Linden, Ala., station. Seven 2,400-hp. compressors are used to boost gas pressure on the main-line system, extending to the New York City metropolitan area. These exhaust mufflers are located in the rear of the compressor building.

CLEANER PIPELINES CO.

1900 Armour Rd. No. K. C. 16, Mo.

EFFICIENT cleaning pays off in increased gas volume.

INTERNAL PIPELINE CLEANING EQUIPMENT:

EXPANSIBLE CLEANERS
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Nozzle sizes from 1/4" to 24" — **ASTM A234**

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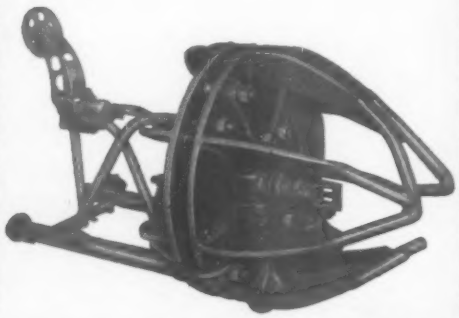

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be mounted on submersible barges in Terrebonne Bay to deliver gas into the main transmission lines at high pressure for movement to the two petrochemical-plant sites.

Gasoline plant . . . Operation of the Paradis gasoline plant, now under construction, will result in production of natural gasoline, propane, and butane, plus residue gas which will be delivered to the two plants. Initial deliveries are expected within a year.

Construction and operation of the extensive gas system and Paradis plant will be under management of Rambin and A. B. Wardlaw, superintendent of gas and gasoline plants in the Louisiana division.

Contract for engineering, design, and construction of the gasoline plant was awarded to O. L. Olson Co., Houston.

Phillips Will Extend Kansas Gathering System

BARTLESVILLE, Okla. — Phillips Pipe Line Co. plans to extend its crude oil gathering system in southeastern Kansas.

The project will consist of 6½ miles of 4-in. pipe line to gather oil from the Beal water flood unit and 2½ miles of 2-in. pipe line to gather oil from the Cartwright water-flood unit, both in Greenwood County.

These additions will connect the water-flood units with the firm's Thrall, Kans., pump station, which is the junction point of Phillip's Kansas and Oklahoma crude lines to Kansas City.

The company is a wholly owned subsidiary of Phillips Petroleum Co.

Lone Star's New Gas Line Ready for Operation

DALLAS.—Lone Star Gas Co.'s 25-mile pipe line to deliver gas from Jameson field in northwest Coke County is ready for operation. Beginning in May it will take approximately 10,000,000 cu. ft. of gas per day.

The 8-in.-diameter line has been completed at an approximate cost of $400,000. Maximum daily capacity is 25,000,000 cu. ft. It will be supplied with residue gas from Sun Oil Co.'s new gasoline plant in Jameson field.

The line extends northwest from a point near Silver to Lone Star's transmission network near the Texas Electric Service Co.'s Morgan Creek power plant 4 miles southwest of Colorado City.

Jameson field has been tapped to strengthen gas supply for distribution systems in Taylor, Nolan, Mitchell, and Scurry counties.

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Construction Starts on New Louisiana Crude Carrier

HOUSTON.—Construction has begun on 55 miles of 16-in. crude-oil trunk line from Raceland to Plaquemine, La.

L. E. Early, Inc., Houston, is doing the work for Interstate Oil Pipe Line Co. of Shreveport.

The new line will approximately parallel an existing 8-in. line. At Plaquemine it will join a 10-in. line which goes to Anchorage Terminal in west Baton Rouge Parish. The capacity of the system will be increased to 65,000 bbl. per day.

The line will provide outlets for crude production from such fields in South Louisiana as Delta Farms, Bayou Perot, Golden Meadow, and Little Lake in the coastal area. Lake Chicot, Raceland, and Napoleonville fields in the Bayou Lafourche area will also be accommodated.

Trans Mountain Makes Line Crossing of Fraser River

VANCOUVER, B. C.—A major crossing of the Frazer River at Port Mann, B. C., was made for the Trans Mountain Oil Pipe Line by Missouri Valley Canadian, Ltd., of Vancouver, the contractor. B. C. Bridge & Dredging Co., Ltd., had the subcontract for cutting a 15-ft. trench below the river bed.

Cost of the underwater crossing, which was backfilled, was about $500,000. Canadian Bechtel, Ltd., is agent for the owner-company.

There are 72 river and creek crossings on the 718-mile route of the oil pipe line between Edmonton, Alta., and Vancouver. About 20 are considered major crossings, and the Fraser River is crossed 10 times.

The Port Mann crossing consisted of three operations: (1) The approach to the water from the south side; (2) the approach from the north shore; and (3) the actual river crossing.

On the south side it was necessary to tunnel a distance of 300 ft. under the Canadian National Railways trackage in Port Mann yards. In this operation the 24-in. pipe was placed in a 30-in. steel casing as added protection. The job was completed without interruption to train schedules.

On the north shore the approach traversed 2,447 ft. of swamp. A corduroy road, topped with hog fuel (lumber mill chips) was laid down for transportation of 40-ft. lengths of pipe with extra heavy wall thickness of ½ in.

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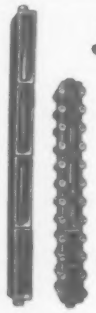

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Among the Drilling Contractors

Drilling Upturn Boosts Number of Active Rigs

For the first time in more than a month the weekly survey of drilling activity records an increase in the number of operating rotary rigs in the United States and western Canada. The latest survey, covering the week ended March 9, shows an over-all total of 2,611 rigs running. This is a net gain of 31 rigs over the number reported the previous week.

A substantial increase in drilling activity in the West Texas and New Mexico area was largely responsible. Gains also were indicated in the Gulf Coast, Arkansas-North Louisiana-East Texas, and western Canada areas. These areas had an aggregate increase of 64 rigs. Declines in other areas, however, totaled 33 rigs, appreciably cutting the over-all increase.

ACTIVE ROTARY RIGS*
(United States and Western Canada)

	Week ended	Change week ended	
Area—	3-9-53	3-2-53	3-10-52
Gulf Coast	599	+ 9	— 5
N. & W. Tex.-N. M.	834	+44	—193
Ark.-N. La.-E. Tex.	110	+ 2	— 44
Oklahoma	316	0	+ 5
Kans.-S. Neb.	159	—17	+ 9
Illinois-Eastern	100	— 1	+ 16
Rocky Mtn.	177	— 7	+ 13
Pacific Coast	155	— 8	— 13
Total U. S.	2,450	+22	—212
Western Canada	161	+ 9	— 16
Total	2,611	+31	—228

*Courtesy Hughes Tool Co. Trends in drilling activity in the United States and the Gulf Coast and Arkansas-North Louisiana-East Texas areas are shown on pages 201 and 202.

Herman Graham Drilling Co., Salem, Ill., now operating three rotary rigs in the West Texas area, reports two new contracts for wells in that area. Both will be drilled for Sinclair Oil & Gas Co. One will be a 9,000-ft. Ellenburger test, a wildcat (1 University Crockett 112), located 9½ miles southwest of the Big Lake townsite, in southern Reagan County. It is 2½ miles north of the World field, in University Lands Survey. The other is a field well, 3 McCatchey State, in Schleicher County.

Crow Drilling Co., Shreveport, has a contract with **Kemp Drilling Co.,** also of Shreveport, for a Tuscaloosa test which the latter contractor has projected for the area 2½ miles northeast of Stringer, in Jasper County, eastern Mississippi. The new operation is 1 Bufkin, located in 26-1n-10e. Objective is around 7,700 ft.

A. W. Williams Inspection Co., Mobile, Ala., is moving a rig from Kemper County, Mississippi, to Florida where it has contracted to drill three wildcat tests for A. R. Temple of Biloxi, Miss. Two of the tests will be in Washing-

OFFICERS AND PROGRAM PLANNERS of the Fort Worth-Dallas chapter of the American Association of Oilwell Drilling Contractors. Left to right: E. Dale Mount, vice president, Harry Bass Drilling Co., chairman; William P. Clements, Jr., general manager, Southeastern Drilling Co., program committee chairman; Mark Gardner (rear), vice president, Delta Gulf Drilling Co., program committee member; C. J. Davidson, president, Davidson Drilling Co., vice chairman; and Mark Hart, vice president, Rowan Drilling Co., program committee member. Mount, Clements, and Gardner live at Dallas. Davidson and Hart are from Fort Worth.

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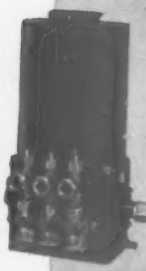
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ton County, and one in Bay County, in the eastern part of the state's panhandle. Depths will range from 4,700 to 5,000 ft.

R. P. Phillips Well Service Co., Lafayette, La., has contracted for a 3,500-ft. wildcat test to be drilled for John Clingingsmith and A. Decambre, Jr., in eastern Vermilion Parish, coastal Louisiana. Location is for 1 LeBlanc, in 49-13s-4e, about 15 miles southeast of Abbeville.

J. C. Means, Jr., Beaumont, Tex., has the contract for a projected 12,000-ft. test being started by K. D. Owen at 1-A Fontenot, in 22-8s-2e, in the Branch area, Acadia Parish, southern Louisiana. Location is about midway between the Branch and Northwest Branch fields.

Sunnyland Contracting Co., Rayne, La., currently one of the most active contractors in Florida, is drilling a 6,500-ft. test for California Co. 2 miles northeast of Santa Maria, in Santa Rosa County, in that state. The new operation is 1 Santa Maria unit, located in the C SE NW 33-6n-36w.

Rex Drilling Co., Shreveport, has a 4,000-ft. Paluxy test under way for Placid Oil Co. on the southeast flank of the North Fouke field, Miller County, Arkansas. **Trans-Tex Drilling Co.,** Longview, Tex., contractor, is starting a Paluxy test for its own account at a wildcat location about 1¼ miles southwest of the Rex job, at 1 Rose, NW NW SW 30-16s-26w.

Crawford Drilling Co., Shreveport, is starting another well for Gulf Refining Co. in the new Sibley field, Adams County, Mississippi. Latest operation, contracted to 6,600 ft., is 2 Ball Unit, located in 20-5n-3w. Objective is the Wilcox.

Justiss-Mears Drilling Co., Jena, La., has contracted for an 8,500-ft. test to be drilled for Durbin Bond & Co., Inc., and Barnett Serio at a wildcat location 2½ miles southeast of Lessley, in Wilkinson County, southwestern Mississippi. Location is for 1 King, spotted in the SW SW SW 28-2n-3w.

Warren-Bradshaw Exploration Co., Tulsa, has been given the contract for Vickers Petroleum Co.'s projected 9,600-ft. test to be drilled about 3 miles southeast of Purdy, in Garvin County, Oklahoma. The test will be carried as 1 Crawford with spot in the C NE NE 31-3n-3w. Location is about a mile north of the one-well Southeast Purdy pool, producing from Springer sand.

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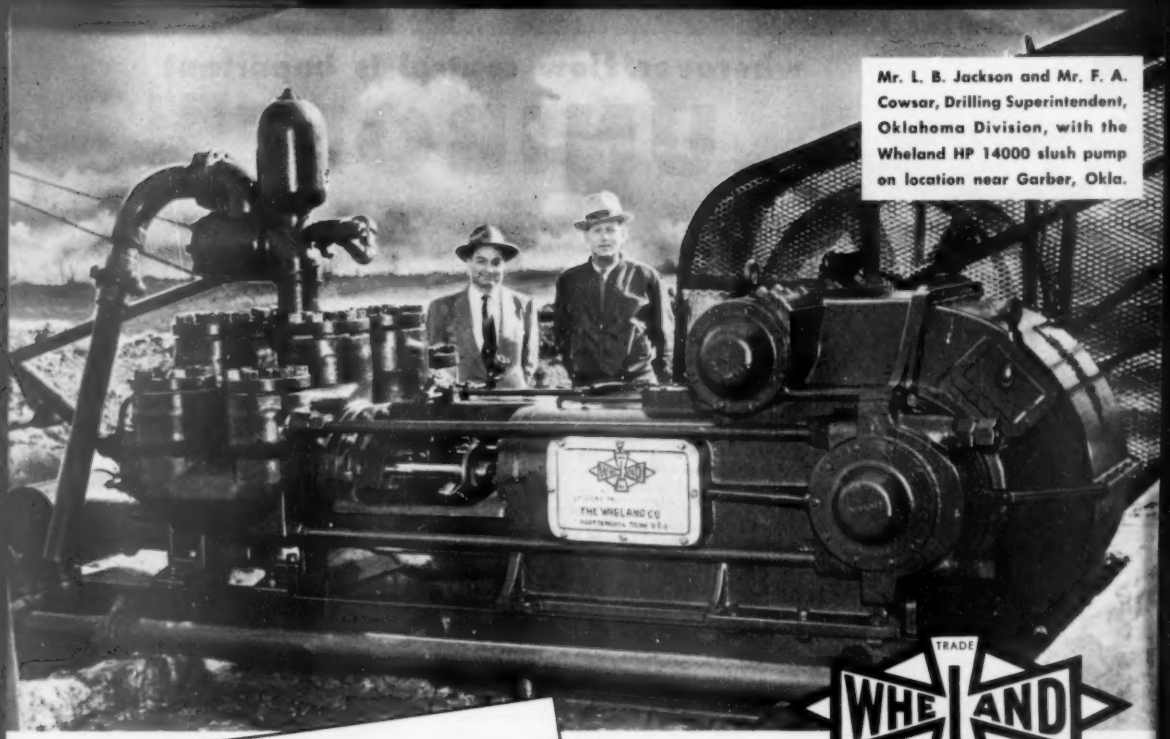

Mr. L. B. Jackson and Mr. F. A. Cowsar, Drilling Superintendent, Oklahoma Division, with the Wheland HP 14000 slush pump on location near Garber, Okla.

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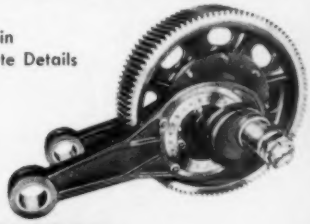

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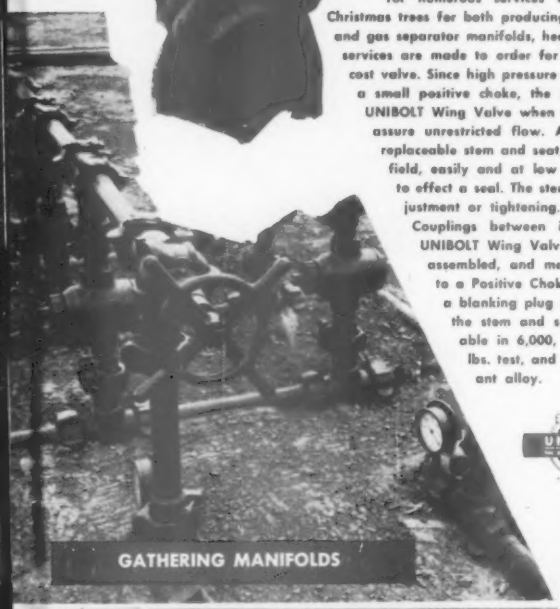

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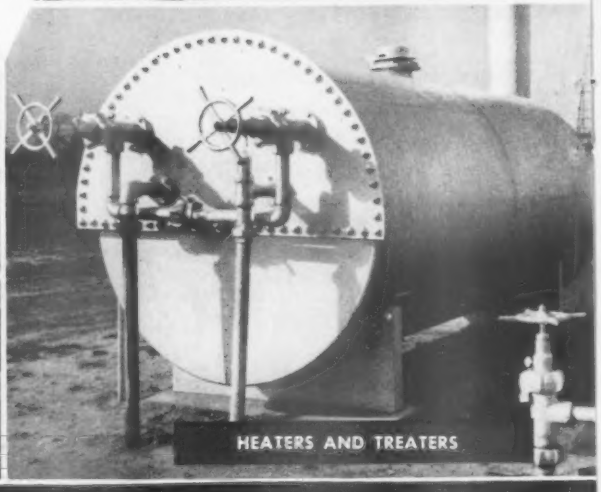

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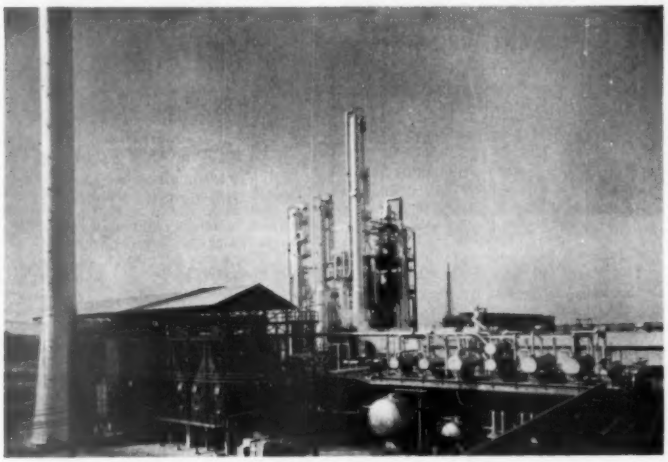

GULF OIL CORP.'S new ethylene plant at Port Arthur, Tex.

World's largest ethylene plant is placed on stream

PORT ARTHUR, Tex. — As the world's largest ethylene plant went on stream here, T. J. Sullivan, Gulf Oil Corp. vice president, revealed that plans are being considered which, if carried through, will result in a second ethylene plant being built to double present production of 2½ billion cubic feet annually.

In addition, an ethylene glycol and ethylene oxide plant would be constructed as part of the same project, he added.

The present unit's entire output has been contracted for by five Texas coast installations, to which the ethylene gas is now flowing through direct-connection pipe lines *(The Oil and Gas Journal, November 10, 1952, page 150)*. These are Koppers Co., Port Arthur; Ethyl Corp., Houston; E. I. duPont de Nemours & Co., Inc., Orange; Monsanto Chemical Co., Texas City; and Allied Chemical & Dye Corp., Orange.

Only a portion of the capacity of the second ethylene plant now under consideration would be offered for sale, Sullivan stated. The remainder would be used to produce 40 million pounds annually, which in turn would be converted into 5½ million gallons of ethylene glycol, used in manufacture of antifreeze.

Plant design . . . The existing plant uses a design wherein a series of fractionating towers separates ethylene, ethane, and other hydrocarbons from refinery gases and a series of cracking furnaces is used for converting ethane to ethylene.

Facilities are self-sufficient and include a power plant for steam and electricity, water-cooling tower and circulating system, tanks, sewers, fire prevention, and pipe lines. Extensive instrumentation permits a large degree of operation from a central control room.

The installation is located on a two-acre site at the company's Port Arthur refinery, and the second ethylene plant together with its related ethylene oxide and ethylene glycol facilities would be erected adjacent to the existing unit. These installations would use direct oxidation method to produce ethylene oxide from ethylene and conventional methods for producing ethylene glycol.

Gulf expanding in petrochemicals . . . "The opening of the ethylene facilities and the consideration being given to doubling ethylene capacity there in the future with part of the output allocated to our operations signifies Gulf's expanding interest in the petrochemical field," Sullivan stated.

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"Although other ethylene sources exist, refinery byproduct gases used in the process at Port Arthur have proved the most economical and practical source of bu'k supply to industry," he said, "and petroleum economy also benefits by upgrading the byproduct gases."

Shell Platformer Put On Stream at Houston

HOUSTON.—A multimillion-dollar integrated "platforming" and aromatics extractive distillation plant has been put on stream at the Shell Oil Co. refinery here.

The p'ant will add about 10 per cent to the nation's domestic output of benzene, which is used in making a wide range of products such as synthetic rubber, nylon, detergents, plastics, and pharmaceuticals. Yearly output of benzene will exceed 19,000,000 gal.

Annual output of toluene, which is vital to the defense program, will exceed 33,000,000 gal. at the plant. It is a component of high-octane aviation fuel, as well as an ingredient of dyes, cleaning agents, enamels, and inks.

The largest installation of its kind in the nation, it is using an extractive distillation developed by Shell. The process, when used in a plant recently completed by Atlas Processing Co., resulted in 99.9 per cent benzene recovery. Over-all plant recovery after treating benzene to nitration quality is 98 per cent.

An outstanding feature of the p'ant is the "Turbogrid" distillation tray, said to be much simpler in design than the "bubble cap" tray, and also to cut down on maintenance and construction costs.

Work on the plant began in May 1951. Excluded are four high-pressure reactors in the platforming unit and 12 distillation columns ranging up to 10½ ft. in diameter and 163 ft. high, plus boiler facilities.

Celanese Adding to Plant

PAMPA, Tex.—Celanese Corp. of America is constructing additional facilities at its chemical plant here to produce vinyl acetate. Initial output is expected during the third quarter of this year.

Vinyl acetate currently is used for safety-glass interlayers, synthetic fibers, soil conditioners, and other applications. A process developed in the company's chemical division research laboratories at Clarkwood, Tex., will be used.

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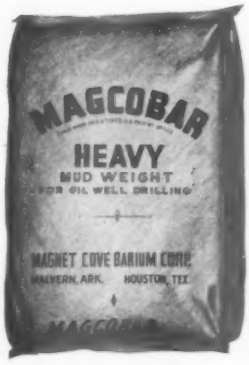

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NATURAL GAS

Gas Exports May Become A Controversial Issue

BATON ROUGE.—Natural-gas exports promise to become as controversial an issue as the tidelands, according to John B. Hussey, Louisiana conservation commissioner.

Recently, the state's Public Service Commission urged the governor and state legislature to consider authorizing a state-wide survey toward need of conservation of gas resources. The resolution stressed the tremendous export of Louisiana natural gas and cited growing industrial needs within the state.

Hussey said that in expressing his unofficial views he was for conservation but against hoarding, and to refuse to export natural gas to other states amounts to hoarding.

Prior to the days of the major pipe lines, the well-head price of gas was as low as 2 to 4 cents per M.c.f., he said; and more gas was wasted then than is being shipped out of the state now, he added.

Hussey said that it was his belief the state was better off now with 12 to 15-cent gas even though most of it was shipped out of the state than it was before the pipe lines.

Approximately 65 per cent of the state's total economy depends upon oil and gas revenues, he added.

Northern National Sets Highs in Sales, Revenue

OMAHA.—New highs in gas sales, revenues, capacity, and gas reserves were set by Northern Natural Gas Co. during the year 1952, John F. Merriam, president of the firm, said here last week.

Gas sales on Northern's system rose to 222 billion cubic feet during last year compared with 199 billion in 1951. Operating revenues totaled $47,400,209.

The system's capacity rose from 675 million cubic feet daily in 1951 to a daily average of 735 million cubic feet during 1952. An increase to 825 million cubic feet was planned but construction was delayed until December 1952 by lack of an acceptable certificate from the Federal Power Commission. Meanwhile, Northern Natural had acquired new leases on about 350,000 acres in sedimentary basins strategically situated near Northern's transmission system.

The firm acquired preferential rights from independent producers to purchase all gas which may become available for sale on about 1.5 million acres lying in prospective areas.

The system's total proven reserves were an estimated 7 trillion cubic feet, calculated at a pressure base of 14.73 psi. Since 1951, the firm has increased its natural-gas reserves 650 trillion cubic feet.

A.G.A. Reports Revenues From Gas Gain 22 Per Cent

NEW YORK.—Revenue from the sale of natural gas to ultimate customers during the last quarter of 1952 amounted to $555,000,000—a 22 per cent increase over the same period in 1951—according to the American Gas Association.

Natural-gas revenues last year totaled $1,954,000,000, a 17.2 per cent increase over the previous 12-month period.

Sale of 13,525,000 therms of natural gas during the fourth quarter of 1952 also showed a 15.4 per cent boost over rates of the same quarter the year before. Natural-gas sales last year of 49,074,000,000 therms showed a gain of 9.7 per cent over the previous 12 months.

However, A.G.A. figures show sales of manufactured and mixed gas declined 3.9 per cent during the fourth quarter of 1952 and revenues in this classification were down 11.2 per cent. Conversion from manufactured and mixed gas to natural-gas distribution in several areas was attributed as the cause.

Gas-Liquefaction Plant Certificate Revoked by FPC

WASHINGTON.—A Federal Power Commission certificate authorizing construction of a gas-liquefaction plant by Chicago District Pipeline Co. has been revoked at the company's request.

The certificate, issued July 27, 1949, authorized the company to build a $6,000,000 plant to store natural gas in liquid form during the warm-weather months for use in the Chicago area during periods of peak winter demand. The plant was to have a storage capacity of 400,000,000 cu. ft. of gas and would have contained facilities for liquefying approximately 4,000,000 cu. ft. of gas daily and for regasification and return to the transmission system of 6,000,000 cu. ft. per hour.

However, Chicago district advised the FPC last December it did not plan to build the plant because of the authorization given Natural Gas Storage Co. of Illinois, an affiliate, to construct and operate an underground-storage project.

T.R.I. Opposes Gas Tax

AUSTIN.—The Texas Research Institute has published a brochure opposing a House Bill for additional taxation on gas.

The bulletin said taxes now levied in Texas amounts to 12 per cent of the total value at the point of production. It said House Bill 460 would add another 28.57 per cent to the taxes as applied to value.

It also quoted U. S. Bureau of Mines figures on 1950 marketed-gas consumption and production to show that approximately half the gas marketed in the nation comes from Texas. Any tax on gas by Texas applies 100 per cent to Texas users, and only 50 per cent to out-of-state users, who get half their gas from other sources, the bulletin said.

Natural Gasoline

Anchor Seeks to Store L.P.G. in Spraberry Field

TULSA.—Anchor Petroleum Co. has filed an application with the Texas Railroad Commission requesting a permit to drill four injection wells in Martin County, West Texas, for underground L.P.G. storage.

The application cited that the wells will be used for storage of L.P.G. products now being produced by gasoline plants operating along the Spraberry trend.

The wells will be drilled to the Permian salt section, and will be completed at an approximate depth of 2,200 ft. Anchor is constructing a loading rack near the storage site which is situated on the Texas & Pacific Railroad.

Location of the storage area is in the south half of Section 23, block 37, T-1-S, T & P survey, 14 miles northeast of Midland, and 6 miles southwest of Stanton.

Plant Gas Input Increased

HEALDTON, Okla.—Harry Ells, Inc., operator of the Shell Barco natural-gasoline plant in the Healdton, Okla., area, is doubling gas input to the operation. Compression facilities are being added to handle an additional 2,000,000 cu. ft. of gas daily.

Production for stepping up the plant's input is obtained by extending gathering facilities to Walnut Creek field at the north edge of Healdton field in Carter County.

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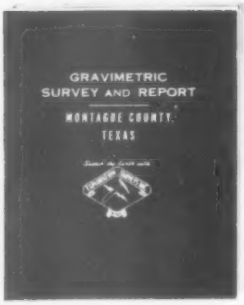

E.S.I. County Reports are available on these Oklahoma counties: Cotton, Harmon, Jackson, Love, Marshall, Tillman, Bryan, Lincoln, Hughes, Garvin, Carter, Jefferson, Stephens, Pontotoc, Atoka, Coal, and Pittsburgh. For Texas: Cooke, Grayson, Montague, Jones, Haskell and Scurry counties.

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EXPLORATION

It Takes Geology to Find Oil

by Philip C. Ingalls

THE accelerating development of elaborate tools or methods to aid in the search for oil often makes it appear to some that the art of finding oil may be trending toward an exact science. Nothing could be further from the truth.

The only known way to find oil in commercial quantities is to drill for it. To drill takes money. To get that money there must be a prospect. A prospect is based on geologic studies, real or imaginary, and aids to exploration are developed to keep the geologic-prospect pot full.

Oil has been found on imaginary-geology prospects and more will be found. However, records show that it ultimately takes many more dollars per barrel of oil to drill an imaginary-geology prospect than it does a real-geology prospect. It was an obvious success ratio that earned the academic and inexact science of geology a place in the oil industry.

About the time that undrilled surface-expressed structures began to dwindle in number, physicists came up with a revolutionary oil-finding tool, the seismograph. The scientists located oil and lots of it without the aid of geologists or more than the most basic geological knowledge. But then, like the surface geologist, geophysicists found their easy hunting grounds were limited. There followed increased use of more and more sciences by the oil industry: paleontology and mineralogy, which had already proved their value in many areas; chemistry; botany; mathematics; and, later, nuclear physics were employed by exploration departments. However, not one of these once-academic sciences has yet been proved to have brought an enduring, self-sufficient oil-finding science into the industry. They have all been devoted to supplementing or improving the understanding of the original oil-finding science, geology.

Paleontology as a pure science cannot find oil, but it can tell an oil finder a great deal about the rocks in which oil is found. It took paleontology to develop regional correlations throughout the world and subsurface correlations in many areas. As oil-finding problems were recognized, paleontologists were able to determine under what conditions their "bugs" lived and ended up tracing shore lines and pointing out regional porosity wedges. The oil-industry paleontologist works toward finding out more about rocks, not fossils.

Mineralogy as a pure science cannot find oil, but, like paleontology, can tell an oil finder a great deal about the rocks in which oil is found. Mineralogists came into the industry to work areas where the paleontologist had correlation troubles. However, these scientists were soon making studies of rocks, especially rock structure favorable for the accumulation of oil. Lithofacies studies have been pointing the way to potential oil areas.

Seismologists can no longer merely count a few of the wiggles on a seismogram for information a new computer can quickly learn to extract. He must not only know his records, he must know about the rocks through which his time measurements are made: whether formations are thickening or thinning and in which directions, expected facies changes, and the possible existence of faults and major subsurface features. Geophysicists no longer believe that if they make an effort to learn the geology there's no reason to make a seismic survey. They now know that drilling on seismic data at face value is often drilling on imaginary geology.

The geophysicists' new bore-hole magnetometers and velocity loggers are designed to learn more about rocks. They are not going to find any oil directly, but they are going to tell more about rocks and thus assist geophysical and geological studies to point the way to finding oil. They were developed because geophysicists know geology is too unpredictable for over-all characteristics of a section to be of help to them in the detail work geophysics is now called upon to perform.

Oil is found in rocks. Exploratory tools must be judged by what they will tell of rocks and their attitudes, by what they can add to geologic knowledge. Oil-finding success is the result of what Ira Cram has aptly called a "crossfertilization of technologies."

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

COLORADO . . . Sherrod & Apperson have the first apparent commercial discovery of oil below the Cretaceous in the Denver-Julesburg basin at 8 Gillette in Keota field, Weld County. The operator reportedly recovered 700 ft. of oil and 90 ft. of oil-cut mud on test of Permian-Lyons (?) sand.

WEST TEXAS . . . The Texas Co. 1 Graf, deep wildcat in west-central Upton County, had flowing oil in the Pennsylvanian Strawn on drill-stem test. Location is 2 miles northeast of a lone Wolfcamp producer and 2½ miles southeast of Ellenburger production in Wilshire field.

MONTANA . . . Sun Oil Co. and Phillips Petroleum Co. 1 Dynneson, C SW NE 32-24n-58e, Richland County, is nearing a new depth for the state. The wildcat is drilling below 11,458 ft. and is making hole at the rate of about 300 ft. per week.

MICHIGAN . . . A very interesting and probably an important oil and gas showing was logged in the Dundee on drill-stem test at Jack Uhl 1 McFarlin, NE NW SW 34-20n-3e, Moffat Township wildcat, Arenac County.

SOUTH LOUISIANA . . . High-gravity oil production is being opened by Sunray Oil Corp. in Northwest Branch field, Acadia Parish. Previous production in the field has been gas and distillate. The new strike, 1 Daly et al., 44-8s-2e, flowed 308 bbl. of 53°-gravity oil daily from 10,834-48 ft.

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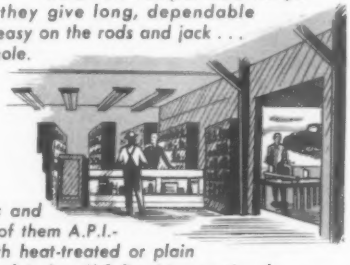

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KANSAS

Committee Names New Pools

Operators have completed 31 new oil and gas discoveries in Kansas so far this year. The Kansas Nomenclature Committee recently gave names to 18 new oil and gas pools in 14 different counties.

Central Uplift. — The Central Kansas uplift has seven new pools. Bieberle North pool was opened by The Texas Co. in Barton County at 1 Schloctemeyer, SW SW NW 33-18s-11w. The discovery was completed for 3,000 bbl. of oil per day from the Lansing. Thill pool in Barton is completing in the Lansing. Pabco Drilling Co. 1 Thill is located in the SW SW NW 28-19s-11w.

Pratt, Rooks, and Rush counties each have new discoveries. Fitzsimmons pool, opened by W. J. Coppinger at 1 Fitzsimmons, SE SE NW 30-27s-13w, was finaled for 1,052 bbl. of oil daily from the Lansing. Mid-States Oil Co. opened Williams pool in Rooks at 1 Williams, SW SW NW 9-10s-18w, for 487 bbl. of oil daily from the Arbuckle. Morrison Drilling Co. 1 Reichel, SW NW NE 23-17s-17w, opens Reichel pool. The discovery is completing from the Lansing. Sterling Drilling Co. opened Salemsborg North pool at 1 Miller for 124 bbl. of oil daily from the Maquoketa.

Stafford County has two new oil pools, Radium and Green Valley. Radium was opened to Birmingham-Bartlett 1 Smith "A," SW NE SW 7-22s-14w, in process of completion from the Viola. Westgate-Greenland Oil Co. 1 Copeland, NW SW SW 2-23s-14w, opened Green Valley for a pump potential of 140 bbl. of oil per day from the Lansing.

Dodge City Embayment.—The southwestern Kansas area has three new pools. Helmers pool, Ford County, was opened by M. B. Armer 1 Helmers, NE NE SE 25-28s-21w, for 5,682 M.c.f. of gas per day from the Mississippian. Kismet East in Meade County, was opened by Columbian Fuel Corp. 1 Wheatley, C NW NW 30-33s-30w. The discovery is completing in the Chester. Colorado Interstate and Hartman opened Westola pool in Morton County at 1 Stoops, NW SW NW 5-32s-42w, in process of completion from the Lansing.

Southeast Kansas. — Two new pools were opened in the old shallow areas of Greenwood County. Ward McGinnis 2 Zimmermann, C NW 19-23s-10e, opened Zimmermann pool for 25 bbl. of oil per day from the Bartlesville sand. Verdigris pool was opened by Susmio Oil Co. 1 Jones, NE NE NE 2-24s-12e, for 7 bbl. of oil per day from the Mississippi.

Southern Kansas.—Barber County and Comanche each have new pools. Skinner Southwest pool was opened by Isern Bros. 1 Skinner, NE SW NE 1-32s-15w, for 2,193 M.c.f. of gas daily from the Douglas sand. In Comanche County Robbins Ranch pool was opened with the completion of Barbara Oil Co. 1 Robbins, SE NE NW 23-31s-16w, for 6,800 M.c.f. of gas per day from the Mississippi.

Uplift flanks.—At the north end of the west flank of the Central Kansas uplift in Sheridan County, Wessel pool was opened by West-Pan Hydrocarbon 1 Wessel, SW NW NW 27-6s-29w. The discovery is completing in the Lansing.

On the west flank of the uplift in Pawnee County, Oro pool and Dues pool were opened by M. B. Armer 1 Ellis, SE SE NE 9-20s-19w, and Westgate-Greenland 1 Smith,

SE SE SW 22-22s-15w, respectively. Oro pool will open in the basal Pennsylvanian, while Dunes was opened with a draw down potential of 2,822 bbl. of oil per day from the Arbuckle.

New Meade Discovery

The East Kismet area of Meade County, southwestern Kansas, has a new Morrow sand gas discovery at Columbian Fuel Corp. 1 Wheatley, C NW NW 3-33s-30w. The strike flowed 5,434 M.c.f. of gas per day on test of perforations at 5,645-52 ft. The new pool has been named Kismet East by the state's nomenclature committee. A previous test in the Chester swabbed 40 bbl. of oil in 32 years from perforations at 5,722-46 ft.

Central Uplift Activity

North-central Ellis County has a new discovery at Carl Lebsack 1 Holy Cross, SE SE SE 26-12s-18w.

The operator is putting the discovery on the pump after swabbing 14 bbl. of oil per hour for 7 hours. The well is located 1 mile south of Koblitz pool and 6½ miles northeast of Hays, Kansas. The well produces from the Lansing.

Operators have set casing at a southern Barton County wildcat, Graybol Corp. 1 B. Smith, SE SE NW 29-20s-13w, 1 mile northeast of Hiss pool. A drill-stem test from 3,544-51 ft. in the Arbuckle recovered 20 ft. oil-cut mud.

Heathman & Co. continue testing after swabbing 3 bbl. of oil per hour for 4 hours at 1 Ganoung, NE NE SE 31-9s-17w, wildcat 1 mile northeast of Plainsville pool and 1¼ miles northwest of Nettie pool in southeastern Rooks County. The oil was swabbed from the Simpson cut at 3,560 ft.

Southern Stafford County has a Viola discovery at Helmerich & Payne's 1 Toland, NE NE NE 10-25s-14w, wildcat 1¼ miles northeast of Jordan pool. A drill-stem test from 4,119-47 ft. recovered 240 ft. of oil and gas-cut mud, 150 ft. clean oil and 30 ft. heavily oil-cut mud.

Rank Test Slated

A rank wildcat has been staked in the Saline basin in Mitchell County. Murfin Drilling Co. will drill 1 Stillwell, SW SW NW 12-6s-6w, 10 miles northeast of Beloit, Kansas. Nearest production is the Salina pool of Saline County, some 50 miles southeast.

MICHIGAN

Arenac Test Has Important Oil and Gas Show in Dundee

A very interesting and probably an important oil and gas showing was logged in the Dundee on a drill-stem test at the Jack Uhl 1 McFarlan, NE NW SW 34-20n-3e, Moffat Township wildcat, Arenac County.

Dundee top was logged at 2,911 ft. Section was cored to 2,988 ft., present depth. Coring was started at 2,891 ft., and first core was pulled at 2,941 ft. This core was bleeding oil from 2,920-25 ft. Second core was cut from 2,941-88 ft. Porosity was indicated in this core from 2,984 ft. to the total depth. A drill-stem test was run with packer set at 2,915 ft. open to 2,988 ft. Tool was open for a total of 22 minutes. Well started to blow gas in 18 minutes, and drill pipe was reported to be filling fast with fluid when tool was closed after a total of 22 minutes. The test

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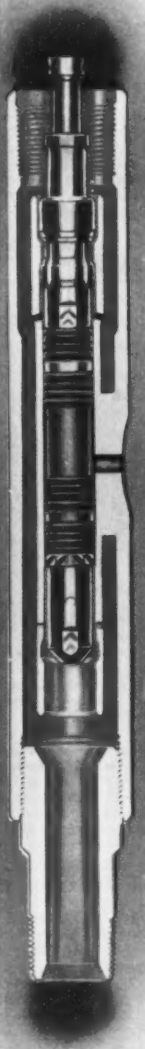

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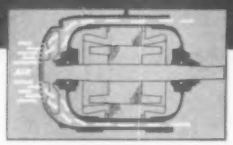

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was quit after this short time because it was feared that well might flow and cover the swampy water in the area with oil. Drill pipe carried 840 ft. of fluid, ranging from free oil to various degrees of oil-cut mud to mud-cut oil when it was pulled. The pipe cleaned itself when joints were broken a stand or two above the indicated fluid level. Bottom-hole pressure was recorded at 1,035 lbs. The pay section was reported to be primarily limestone, but with some dolomite around the many vugs in evidence. Analysis showed that the section had connected permeability.

This wildcat is in an area which has been considered potential for many years. It is nearly surrounded by what are considered to be good geological control wells, one or more of which carried oil in the Dundee. This wildcat is structurally higher than any other well drilled in the area. One wildcat, drilled previously in the NE NW NW 33-20n-3e, carried a hole full of oil natural from the Dundee in 7 hours, but this test was not completed as an oil well. The 1 McFarlan is located about 2 miles northwest of North Adams field and about 4 miles northwest of Deep River field, both Dundee producing areas and two of the best oil fields ever developed in Michigan.

ARKANSAS

Confirmation Finaled in Northwestern Gas Area

Linville field, Johnson County, northwestern Arkansas, has been confirmed by Big Chief Drilling Co. 5 Low-Gap unit, 19-11n-24w.

The gas area was opened in 1951 by Pure Oil Co. with gas production from the lenticular sands in the thick Atoka formation of Pennsylvanian age at depths of between 1,000 and 5,300 ft. The 5 Low-Gap unit well came in for 140 M.c.f. of dry gas per day from the Atoka sand at 1,180-1,220 ft. The field discovery well was Big Chief's 3 Low-Gap unit, Section 30-11n-24w, which gaged 700 M.c.f. of dry gas per day from the Atoka. Pure drilled both wells, but Big Chief was the completer. The wells are shut in pending an outlet.

This area of the state produces only dry gas with no oil associated with the gas. The fields in the area lie along east and west trending anticlines, sometimes faulted. There are 25 producing areas in this section of the state, all producing from the Atoka but one. One field produces from the Pennsylvanian Hale formation and the Atoka. The reserves of dry gas in Northwest Arkansas at the end of 1951 were estimated at 188,864 M.M.c.f., and cumulative production to that time stood at 214,060,107 M.c.f. of dry gas.

Good Month in State

Operators in Arkansas opened two new oil fields and uncovered four new pay zones in established fields during February.

McAlester Fuel Co. opened West Midway field in northern Lafayette County, completing 1-B McDonald, 7-15s-24w, in the upper part of a 28-ft. effective pay section in the Smackover lime. Sunray Oil Corp. has built roads to an east offset location.

Carter Oil Co. opened Pigeon Hill field in Section 28-16s-12w, northern Union County, at 1 Goodwin. The well pumped 53 bbl. of 15°-gravity oil daily from the Cotton Valley.

The most important new pay discovery was Hunt Oil Co.'s Hill sand oil strike on the west edge of prolific new Springhill field,

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southern Union County. The discovery flowed 221 bbl. of oil per day from the Hill sand. The field's producing horizon is the Tokio.

Hunt has started two new Rodessa ventures in the new discovery. A new test has been begun south of the pay opener in Webster Parish, Louisiana, by another operator.

Kirby Petroleum Co. opened Nacatoch pay on the west side of Calion field in Union County, while McAlester Fuel Co. opened Tuscaloosa oil pay on the west edge of Hibank field. Hogg sand production was also opened in Hibank field by Murphy Corp.

Due to the high gas-oil ratio in the Nacatoch discovery at Calion, little development is expected in that area, while little work is expected also at the Hogg sand strike in Hibank, due to its position on the Hibank fault. Noncommercial production was found at previous offsets to the south and west of the discovery.

Geophysical exploration in Arkansas during February amounted to 17 crew weeks, mostly in the central eastern areas. Of the total 17 crew weeks, 12 were seismograph, four gravitymeter, and 1 magnetometer.

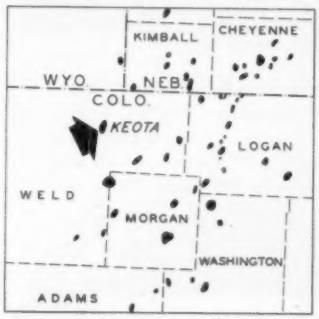
ROCKY MOUNTAIN

COLORADO

Permian Oil Recovered

A deep Denver-Julesburg basin wildcat recovered Permian oil on drill-stem test of the Lyons (?) sand in apparently commercial quantities at Sherrod & Apperson's 8 Gillette, C NW NW 9-9n-61w, in Keota field, Weld County. The recovery is the first of possible commercial significance from formations older than Cretaceous within the Denver-Julesburg basin.

The Tulsa operators are continuing the deep test as a tight hole, and no official release of information has been made. Reports generally credited in Colorado indicate that the test was run of the approximate interval 8,489-99 ft. and the tool was open about 15 minutes, shut in for an equal length of time.



The recovery, in addition to water cushion, was approximately 700 ft. of black oil, reported to be about 32° gravity, and 90 ft. of oil-cut mud. Pressures were not reported.

The operator had drilled approximately 25 ft. of saturated sand before running test and is now coring ahead below 8,500 ft. The recovery of oil from formations below Cretaceous is of great importance to future drilling through this basin. Keota field is the westernmost producing area along the general trend of production in northeastern Colorado, and the deep test is the first in this part of the basin.

Very few deep wildcats have been drilled in

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the producing areas of the Denver-Julesburg basin. In western Kansas, Ben F. Brack completed a small Pennsylvanian discovery in 1951 which later was proved non-commercial. This was the only production from older beds within the basin, and it lies outside the more established producing areas.

First discovery in Keota field was made by Wycold Development Co. of Cheyenne, and the properties of this operator were later acquired by Sherrod & Apperson. There are now 17 producing wells in the field with all of them producing from "J" sand. Production at Keota is slightly in excess of 1,500 bbl. per day.

The formation tested in the current wildcat is not identified by the operator, but geologists have correlated the zone tentatively as Lyons sand.

WYOMING

Frontier Oil Tested At Coon Creek Well

George J. Greer, trustee, of Dallas has recovered oil on drill-stem test of the First Frontier sand in Government 2, NE SE SE 22-55n-97w, in the Coon Creek area of Big Horn County, Wyoming, for another potential discovery in that state. The wildcat is northwest of a failure drilled by Stanolind Oil & Gas Co. a year ago. With top of Frontier logged at 4,615 ft., test was run on the interval 4,614-33 ft. There was gas at the surface in 30 minutes and recovery was 81 ft. of 50°-gravity oil, and 121 ft. of oil-cut mud.

The Stanolind failure was located in NW NW NE 26-55n-97w. It was bottomed in Madison at 8,450 ft. The Greer wildcat is located on a farmout from Stanolind. The operator plans to drill ahead and test second Frontier sand.

Testing New Tip Top Wyoming Producer

General Petroleum Corp. has reported a recovery of 40 bbl. of 61°-gravity oil on 3½-hour drill-stem test of 71-11-G, NW NE NE 11-28n-114w, a northwest diagonal offset to the Tip Top discovery completed in Sublette County, Wyoming by this operator in 1951. Test was of the zone 9,988-10,019 ft. in Nugget sand. The discovery well produced a similar grade of crude oil at the rate of 266 bbl. per day from the zone 9,678-9,807 ft.

The current well is of particular interest since General Petroleum has drilled two failures in the area since the discovery. The production at Tip Top is the first in the general overthrust area on the west side of the Green River basin from horizons below Tertiary.

More Saturation Cored At North Sand Draw

Sinclair Oil & Gas Co., and Stanolind Oil & Gas Co. have cored additional saturation from Tensleep at 1 Unit, SW SE SW 21-33n-95w, in the North Sand Draw area of Fremont County, Wyoming. The well made 725 ft. of 40°-gravity oil and 450 ft. of heavily oil and gas-cut mud on test in the top of Tensleep at 10,727-754 ft.

Cores below 10,754 ft. have shown additional saturation but tests have shown the formation to have fair to poor porosity. Test from 10,754-776 ft. recovered 3,600 ft. of 10 to 50 per cent oil-cut mud through ¼-in. choke in 1 hour. A core 10,776-797 ft. consisted of 15 ft. of hard, grey-green tight, dolomitic sand, with staining. The operator is preparing to test at present total depth of 10,797 ft.

MONTANA

Shell Tests More Oil At Cabin Creek

Shell Oil Co. is at total depth of 7,483 ft. and is running drill-stem test in the Madison discovery 1 Unit, NW SE NW 35-10n-58e, in the Cabin Creek area of Fallon County, Montana. Last reported test was of the interval 7,310-60 ft., and complete recovery was 1,400 ft. of gassy, oily mud, 40 per cent oil; 3,300 ft. of clean oil and 760 ft. of muddy, oily water, 20 per cent oil. Tool was open 2½ hours.

The wildcat, apparently a very important development in eastern Montana portions of the Williston basin, is the first to show for production from Mississippian formations along the Baker-Glendive anticline.

The operator is expected to drill ahead to Ordovician at about 9,000 ft. This deeper horizon produces in Pine Unit field, about 15 miles to the northeast of the Cabin Creek discovery.

New Depth Record For Montana Near

A new drilling depth record for the State of Montana is to be established in the coming week if operations proceed as planned in the joint Sun Oil Co.-Phillips Petroleum Co. wildcat in the Bronson area, northwest of Sidney, Richland County, Montana. The well, 1 Dynneson, C SW NE 32-24n-58e, is now drilling below 11,458 ft. and has been making hole at the rate of about 300 ft. per week. The depth record for the State of Montana is now held by Shell Oil's 1 Crow Tribal, NE NE NE 36-9s-37e, in the Ash Creek area of Big Horn County, which was abandoned at 11,519 ft.

The Sun-Phillips wildcat is scheduled to test to Ordovician at about 13,000 ft. The wildcat is the first in the deeper areas of the basin in Montana and has recently been one of the most closely watched wildcats in the entire Williston basin. The most encouraging recovery to date from this wildcat was that of 5 ft. of free oil on drill-stem test from 10,455-10,504 ft. in Upper Devonian (?).

NORTH DAKOTA

Williston Tests Staked

Lion Oil Co. has announced location for a test to Devonian in Bottineau County, North Dakota in the central Turtle Mountain area. The wildcat is 1 Erickson, C NW NE 32-164n-79w, northeast of much of the current work in the area and 2 miles east of Ward Williston Drilling Co.'s 1 Klokstad, NE NW 36-164n-79w, which recovered 115 ft. of free oil from Madison, and has not yet been fully tested.

Also on the east side of the Williston and southeast of the Turtle Mountain area Holbert Drilling Co. has staked location for a test to granite at 1 Dunbar C NW NW 13-146n-63w, in Foster County. The well is located on a seismic prospect.

KENTUCKY

EASTERN KENTUCKY

In Bell County southeastern Kentucky North American Petroleum Co. has finaled its wildcat 1 Viall. Located on Stoney Fork, well gaged initially at the rate of 700,000 cu. ft. of gas daily from the Big lime (Mississippian) topped at 2,507 ft. and bottomed at 2,784 ft. Top of pay was logged at 2,757 ft. Rock pressure is 530 psi. Test was lo-

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cated about 12 miles east of gas production in Artemus-Himyar gas field of adjoining Knox County.

OKLAHOMA

North Orlando Has New Oil Pay Zone

Southern Noble County's North Orlando field has a new oil pay zone, the Skinner sand.

The discovery well is Newton Barrett, Grady Musgrave, and Midwest Oil 1 Steiner, off the west side of the pool in SE SW SW 19-20n-1w. The successful test was made at 4,732-48 ft. Gas showed at the surface in 10 minutes at the estimated rate of 250,000 cu. ft. per day. Recovery was 390 ft. of free oil and 30 ft. of heavily oil-cut mud. The Skinner pay will be perforated and sanfraced.

Production was first opened in the area in 1951 at T. N. Berry's 1 Nelson in the NE NW NE Section 30. That well was completed in the Perry gas sand with initial production 7,300 M.c.f. per day. Barrett, Musgrave, and Midwest opened oil production at 1 Lively in the NE SE SW 19-20n-1w in late 1952 from the second Wilcox sand. The well pumped 16 bbl. of oil in 12 hours. Later the well was recompleted in the first Wilcox sand pumping 42 bbl. of oil per day.

New Pay Due Northeast Prairie Valley Pool

Garfield County's Northeast Prairie Valley pool has an indicated new pay, the Marshall sand.

George W. Deck, F. A. Gillespie & Sons, and Fordee Rhoades Oil Co. will make tests at 1 Dyer, SW NW SE 5-23n-4w. Casing was run to 6,240 ft. after good tests of the Marshall and second Wilcox sand. The well flowed an estimated 35 to 40 bbl. of 40°-gravity oil per hour in the Marshall at 6,110-15 ft. The 1 Dyer recovered 115 ft. of oil and oil-cut mud on a test of the second Wilcox 6,173-92 ft.

The area's productive zones at present are the Misener, Mississippi and second Wilcox. Northeast Prairie Valley pool was opened by Gillespie and Fordee Rhoades in the second Wilcox oil sand and Mississppi gas-distillate pay at 1 Cogswell heirs, SW SE NW Section 5.

Distillate Shows Logged At Edmond Area Test

Good distillate shows were tested in the Simpson dolomite at an Oklahoma County wildcat 4 miles west and 4 miles north of Edmond.

Calvert Drilling Co. and Huffman & Malloy et al 1 Salisbury, SW SE NE 13-14n-4w, logged shows of gas and distillate on drill-stem tests in the Simpson dolomite. The first test from 6,446-80 ft. flowed gas in 5 minutes at the estimated rate of 2,000 M.c.f. per day with recovery of 170 ft. of distillate-cut mud reported. A second test from 6,475-6,508 ft. flowed gas in 5 minutes at about the same rate with recovery of 105 ft. of distillate-cut mud reported. Operators will continue to drill on the 6,750-ft. Wilcox sand contract.

Operators have tested more gas pay at the well on a test of the Simpson series from 6,602-25 ft. The well flowed gas at the rate of 2,500 M.c.f. per day and recovered 70 ft. of distillate-cut mud.

Air-Drilled Test

A geological wildcat will be drilled in Beckham County's Sayre district, southwestern Oklahoha, using air as the circulatory medium. Rogers-Fain Drilling Co. 4 Windle, NW NW SE 31-9n-23w, will go to 5,600 ft. The area recently received a revived oil pay in the old gas region from the 2,900-ft. granite wash.

Cimarron Wildcat Tests

The Oklahoma Panhandle area has a new important wildcat under way. Cities Service Oil Co. will test possible pay zones at a venture 1 mile north of Sturgis, 4 miles southeast of the new North Sturgis gas discovery which was recently completed by that company. The 1 Whisennand, NE NE SW 2-5n-9eCM, is at total depth of 4,872 ft. with casing set at 4,725 ft. The wildcat is located east of the Keyes gas district.

New Emphasis on Kingfisher

A gas show has been reported at a wildcat northwest of Dover in Kingfisher County, reviving interest in this north-central Oklahoma area.

Champlin Refining Co. et al 1 Andrew W. Wiley, C NW NE 10-18n-8w, about 11 miles west and south of Hennessey, flowed gas in 7 minutes at the estimated rate of 200 M.c.f. per day from an unidentified zone. The drill-stem test was made at 7,136-7,234 ft. The show was apparently in the basal Pennsylvanian or Upper Mississippian.

Another important development in Kingfisher is the revival of activity at Southwest Dover pool, about 6 miles southeast of Champlin's 1 Wiley. Trigg Drilling Co. is testing 1 Porter in the NW NE NE 21-17n-7w in the Misener sand gas-distillate pay with total depth at 8,068 ft. Trigg has staked a new location in the area, also. The new start is 1 Lee Boecher, SE NW SE 16-17n-17w.

NEW MEXICO

SOUTHEAST NEW MEXICO

Bronco Field High On New Mexico Side

While Amerada Petroleum Corp. 2 Weems, offset test to the Bronco field discovery on the Texas side, was running structurally low, the same firm's 1 H. D. Schneck in 14-13s-38e, Lea County, was running high.

Top of the Devonian was 11,402 ft., minus

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datum point of 8,015 ft., or around 275 ft. high to the field discovery. According to field sources, only one test had been made in the Devonian although oil shows have been logged. Operators were trying to establish water table, then plug back for production tests. A 4-hour test between 11,785-826 ft. recovered water blanket and 1,630 ft. of formation water.

Continental Oil Co. 1 Anderson Ranch Unit, Lea County wildcat 3½ miles southwest of the Saunders field, had packer trouble after 1 minute on drill-stem test of the Devonian to 13,427 ft., total depth, but recovery was 1,500 ft. of heavily oil and gas-cut mud and 3 ft. of clean oil. Another test was under way. Continental's well was running an estimated 468 ft. high on the Devonian to Buffalo Oil Co. 12 Baish, Devonian discovery in the Maljamar field, 8 miles to the south.

Gulf Oil Corp. 1 Federal-General American Oil Co., Ellenburger failure in the Grayburg-Jackson field of Eddy County, flowed oil from a section in the lower Permian, establishing a new and deeper pay for the field.

Perforations at 9,184-90 ft. kicked off after swabbing and flowed 50 bbl. oil the first hour, then 40 bbl. an hour for the next 3 hours, through ¼-in. choke.

Further exploration in old areas was in prospect as Stanolind Oil & Gas Co. announced location for 1-AB State, 13,000-ft. wildcat on the south side of the shallow Red Lake field. Location is NW SE 29-17s-28e.

CANADA

Loomis Area Has New Oil Discovery

One medium gravity crude oil strike and another find of natural gas were recorded in western Canada during the past week. The oil discovery was made in the Loomis area of southwestern Saskatchewan, while the gas find was chalked up in the Sullivan Lake area of southeast Alberta.

The medium gravity oil find was made by Tide Water Associated Oil Co. at its Loomis wildcat, located 85 miles southwest of Swift Current and around 20 miles southwest of Eastend oil pool. Tide Water 1 Loomis, LSD 5, 1-3-21w3, indicated oil discovery in the Jurassic formation, during drill-stem test at 4,600 ft. Ninety-minute test gave up 420 ft. of gassy oil and 30 ft. of drilling mud. Gravity of oil recovered was estimated at 20°. Crew was continuing to core and test in the Jurassic at last report.

Another gas find was chalked up at Sinclair Canada Oil Co.s 1 C. P. R. Giere driller in the Sullivan Lake area of southeastern Alberta, 15 miles north of the town of Hanna and 110 miles northeast of Calgary. This well which had previously found natural gas in the Viking sand formation flowed gas from the Lower Cretaceous formation at over 6,000,000 cu. ft. daily. Half-hour test at the well, drilling in LSD 6, 15-33-13w4, of interval 3,640 to 3,663 ft. through a ½-in. choke, flowed gas at about 6,000 M.c.f. daily. No fluid was recovered on test and crew is now making hole below 4,018 ft., heading down for its main Devonian objectives.

Approximately 24 ft. of D3 oil pay was found at the Samson Lake area crude-oil discovery, drilled by the Seaboard-Honolulu-Merrill-Canadian Colleries and Gulf Oil Group, 4½ miles southwest of Malmo area, Devonian oilfield. The well, Seaboard-Gulf 1 Samson Lake, LSD 1, 20-43-22w4, found oil bearing D3 reef from 5,352 to 5,376 ft. Drill-stem tests in the discovery horizon flowed oil to surface from the top of the zone, while salt water was recovered on tests below the 5,376-ft. level. Drilling was finished at 5,381 ft. and 7-in. production casing was set to 5,379 ft. with 230 sacks. Production casing will be perforated opposite the pay zone and production tests run early next week.

The California Standard Co.'s wildcat in the Homeglen area of central Alberta, 14 miles south-southwest of D3 Devonian oil production in Pigeon Lake oil field encountered formation water during drill-stem test some 458 ft. below the top of the D3 formation. Homeglen 3-29, LSD 3, 29-43-1w5, opened up and tested over 400 ft. of gas and condensate bearing D3 before entering an oil column. First test run in the oil column flowed crude oil at daily rate of 240 bbl., while subsequent tests gave up sizable recoveries of crude oil down to a total depth of 7,986 ft. A thin porous oil zone has been indicated, in comparison to the thick 'wet gas' bearing gas cap. Crew was running logs of the well bore at last report, and is expected to commence production testing within about 1 week.

The West Nevis Unit No. 10-8 step-out to the Nevis area oil and wet gas producing area has been completed as a potential gas well from the D2 formation. The well, drilled on LSD 10, 8-39-22w4, found the D3 zone, which is productive of some oil and wet gas at other wells in the general area, to be water loaded, and was plugged back from total depth of 5,951 ft. to 5,815 ft. Tests in the D2 flowed gas at 6,500 M.c.f. daily, which was accompanied by oil and water. Perforations of the interval 5,775 to 5,782 ft. yielded 850,000 cu. ft. of gas and fluid recovery of 2 to 4½ bbl. The liquid consisted of 75 to 80 per cent oil and the balance formation water. The well was drilled on unitized acreage, with Sun Oil Co., British American Oil Co., The California Standard Co., Hudson's Bay Oil & Gas, Imperial Oil, Ltd., Federated Petroleums, Ltd., and United Oils, Ltd., each having a percentage interest.

The Grassy Lake Syndicate and a group of Alberta businessmen have been assured of oil success at its second driller in the Grassy Lake area of southern Alberta, 20 miles northeast of Taber. This follow-up, drilled ¼ mile south of the Ellis sand oil discovery, indicated oil success during first drill-stem test in that same formation.

The new producer, Grassy Lake 2 Glenphyll, LSD 2, 10-11-13w4, is located about midway between Lethbridge and Medicine in southern Alberta. One-hour drill-stem test of the interval 3,044 to 3,060 ft. gave up 1,800 ft. of clean crude oil. Gas flowed to surface 7 minutes after packer was opened.

The discovery well, 1 Glenphyll, was placed on steady production a few days ago, and indicated a pump potential of 50 bbl. daily, of 26.6° crude oil.

LOUISIANA

SOUTH LOUISIANA

Oil Production Found in Northwest Branch Field

High-gravity oil production is being opened by Sunray Oil Corp. in its Northwest Branch field, in Acadia Parish. Previous production in the field, discovered in 1951, has been gas and distillate.

The new discovery well, 1 E. T. Daly et al, located in 44-8s-2e, flowed 308 bbl. of 53°-

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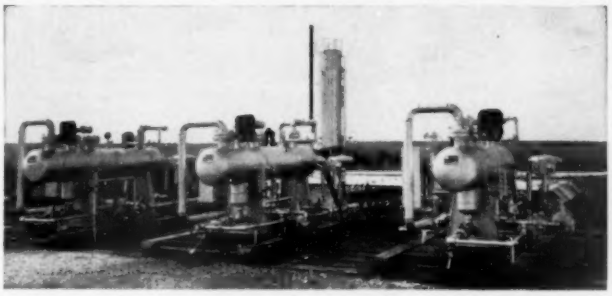

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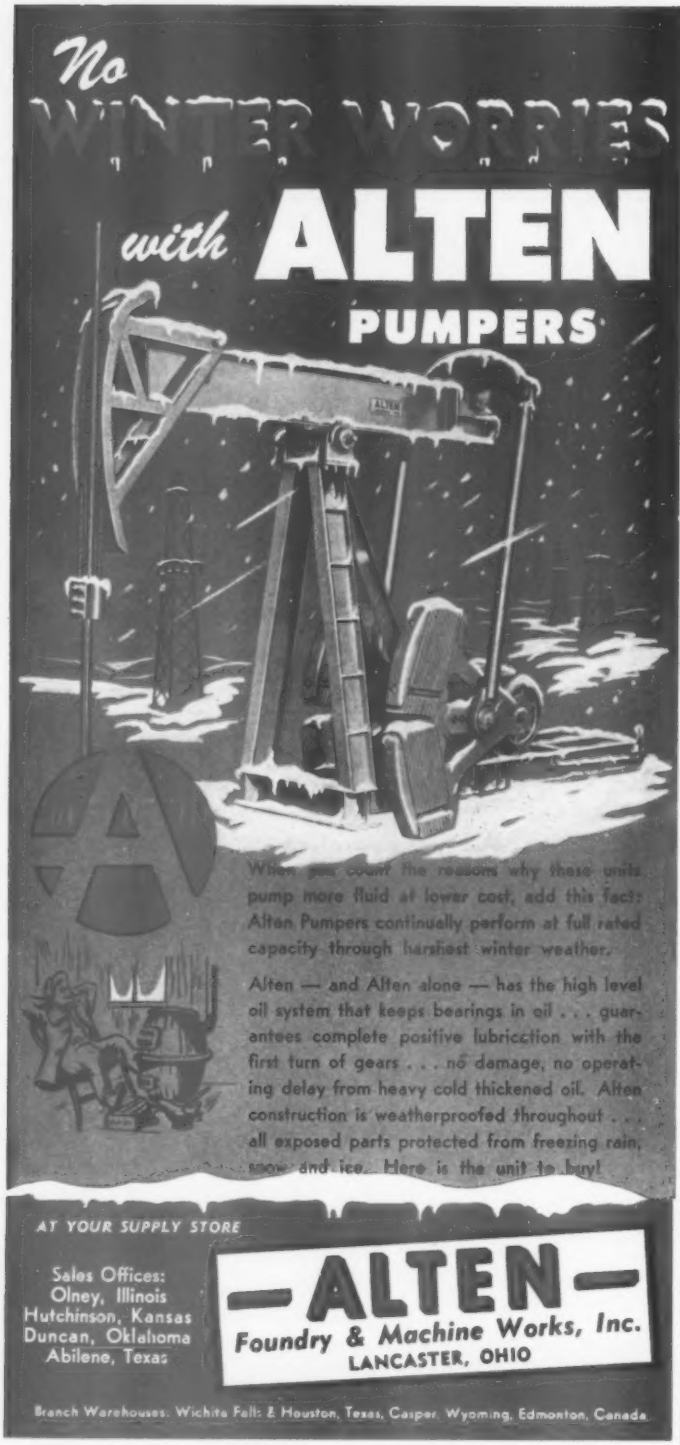
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gravity oil per day through 10/64-in. choke with 2,500 psi. tubing pressure and a gas-oil ratio of 2,370 cu. ft. per barrel.

The pay zone, a 116-ft. section with 55 ft. of net sand, is open through casing perforations at 10,834-48 ft. Hole was drilled to 10,905 ft. and cased through the section to bottom.

The field's gas-distillate producing sand, in which two wells, both drilled by Sunray, have been completed, is at a deeper level. The latter wells had the shallower sand, but did not attempt to complete in it.

Location of the new oil well is approximately a half mile northeast of the initial gas-distillate well, 1 Loewer, in 45-8s-2e, and about the same distance to the northwest of the second, 1 Fontenot, in 80-8s-2e. Another test, 1 Medlenka, is being started at a location in 81-8s-2e, southwest of 1 Loewer and southeast of the new oil well, for further evaluation of Sunray's 7,000-acre block.

Two New Fields Indicated For St. Landry Parish

Two new discoveries are indicated in St. Landry Parish, one by Stanolind Oil & Gas Co. located 2 miles east of production in the Port Barre field, near Opelousas, and the other by Humble Oil & Refining Co. in the Grand Coteau area, 6 miles southeast of Opelousas.

Stanolind's prospective discovery well, 1 St. Landry Parish School Board, in 16-6s-6e, flowed gas and amber-colored distillate, no gage, while cleaning through ⅛-in. choke from casing perforations at 12,269-90 ft. Previously, the well had encountered high pressures from casing perforations at 13,273-95 ft.

Humble's well, 1-B Catholic Church, in 120-4s-7e, is testing zone opposite which casing is perforated at 9,739-48 ft. A preliminary drill-stem test of the perforations recovered 60 bbl. of clean oil with 30 bbl. of water. Total depth is 10,595 ft.

NORTH LOUISIANA

Oil Fields Extended

One eastern Louisiana oil field was extended in February, while Webster Parish in northwestern Louisiana had a new oil field extension.

Barnett Serio completed 1 Savage, C NE NE 12-7n-6e, extending Concordia Parish's Wildsville field ¾ mile north and slightly west. The well flowed 176 bbl. of Wilcox sand oil per day from perforations at 5,095-98 ft. with about 10 ft. of net pay sand reported.

In Cotton Valley field, Webster Parish, Magnolia Petroleum Co. extended Pettit production to the northeast flank of Cotton Valley production. The 2 Grant-Wadley, C NW SE 7-21n-9w, is expected to cause a revival of activity in this area of the field. Production came from perforations at 5,680-89 ft.

Geophysical Activity

A total of 65 crew weeks were consumed in northern Louisiana during February. A total of 53 seismograph weeks were reported, 8 gravitymeter, and 4 core-drill. Bossier and Webster parishes led the activity with nine and six seismic crew weeks, respectively.

More Springhill Work

The two-state Springhill field of Webster Parish and Columbia County, Arkansas, has a new 6,000-ft. Pettit test slated for the west side of the field.

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The new wildcat test, John B. Stephens,, Jr., and A. O. Phillips 1 Mattie Grafton, Section 2-23n-11w, Webster Parish, is just southwest of the recent Hill sand discovery made in Columbia County, Arkansas. The Hill discovery, made by Hunt Oil Co. at 2 Dennis, 11-20s-23w, Columbia County, lies 1,650 ft. northeast of the new Pettit test. The Hill strike flowed 221 bbl. of oil per day, but had noncommercial showings in the Pettit.

Also in Springhill field Hester & White will deepen to 6,100 ft. at 1 White, C NW SW SW 8-23n-10w, a 3,120-ft. Tokio dry hole southeast of the field in northern Webster Parish. The operators will test the Pettie lime, productive in North Shongaloo field, about 2 miles to the east. The try is also located about 3 miles southeast of the new Hill sand production on the west edge of Springhill field.

TEXAS

WEST TEXAS

Rapid Drilling Planned Around Shallow Discovery

Trebol Oil Co. and E. G. Rodman, Midland, have announced 8 new locations for 2,000-ft. cable tool tests to develop their Grayburg discovery of the Rodman-Noel pool in southern Upton County. Location for all tests are in Section 1, GC&SF Survey, 10 miles east of McCamey. The new field is in a Grayburg producing area, being about equal distance from the Hurdle, Web-Ray and Crockett fields.

A new light was thrown on this old area when Trebol & Rodman 1 Radford Grocery was recently completed flowing 960 bbl. of 26°-oil a day from open-hole pay at 1,702-54 ft., total depth.

Oliver & Kotyza have made location for a Grayburg test 1½ miles northwest of the above area, but separated from it by two dry holes, as 1-A Carney, in 2-1-MK&T.

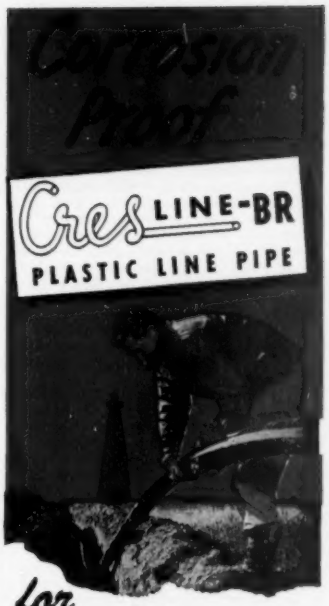
Deep drilling . . . Meanwhile, deep exploration in Upton County continued its steady pace, which last year helped to boost the county's production from 12,000,000 bbl. in 1951 to nearly 25,000,000 bbl. in 1952.

The Texas Co. 1 Graf, deep wildcat in west-central Upton County, had flowing oil in the Pennsylvanian Strawn on drill-stem test. Top of the Strawn was 9,775 ft., minus 6,955 ft. First test from 9,771-9,850 ft. had 51°- oil at the surface in 35 minues and flowed around 14 bbl. an hour. At 9,876-9-910 ft. a test recovered some free oil and heavily oil-cut mud. Operators were drilling ahead on a 13,000-ft. contract.

Location is 2 miles northeast of a lone Wolfcamp producer and 2½ miles southeast of Ellenburger production in the Wilshire field. Development drilling in the Wilshire field added 23 producers last year, mostly on the north and east side of the field.

In northern Upton County, Magnolia Petroleum Co. 1-B Windham was swabbing load oil after plugging back to 11,425 ft. This well has reported gas and gas-cut mud only on drill-stem tests below 11,000 ft. Location is a south offset to Magnolia 2-A American Republics, southeast extension try to the Pegasus field, which first completed as a small Spraberry well last week. Last week the 2-A American Republics added Wolfcamp pay, completing as a dual well. New pay and potential was 53 bbl. of 42°-oil a day from perforations at 9,948-9,976 ft.

A dual completion, and second well in the Devonian, was in the completion stage at the northeast tip of the Pegasus field, on



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the Midland County side. Magnolia 1-S TXL, north offset to Superior Oil Co. 4-16 Windham, flowed 388 bbl. of 55°-oil in 15 hours, through 14/64-in. choke, from perforations at 12,361-401 ft., apparently in the Devonian. Calculated potential was 620 bbl. of oil daily. Top of the Ellenburger was 13,-118 ft., and operators had set packer at 12,310 ft. for tests of the lower zone.

Yoakum County . . . Cabot Carbon Co. 7 Wright, deep test in the Prentice field, found deeper pay sections of the Clear Fork while penetrating the entire section, first such well in the field. A 2-hour test at 7,980-8,055 ft. recovered 7 ft. of oil and 228 ft. of oil and gas-cut mud. A previous test from 7,893-7,980 ft. developed a total of 476 ft. of oil-cut mud. Operators have tested the Clear Fork section at intervals of 50 ft., which has had oil shows from around 6,655 ft.

Present production in the Prentice field is from the 5,900-ft. Glorietta and the 6,700-ft. Clear Fork.

Amerada Petroleum Corp. 2 Weems, northeast offset to the Bronco field of northwest Yoakum County, was running from 60-70 ft. low to the field discovery. Tentative top on the Mississippian was 11,035 ft. Top on the Wolfcamp in this well was reported 45 ft. low to the discovery.

EAST TEXAS

Sun Oil Co. 2 Hitts Lake Is Confirmation Well

Sun Oil Co. completed a second Paluxy well in the new Hitts Lake field of Smith County, and staked location for the third test.

Potential on the confirmation well was 213 bbl. of 26° oil a day from perforations at 7,224-7,300 ft., through 5/32-in. choke. Total depth was 7,341 ft. This well ran about flat with the discovery, which finished through perforations at 7,174-7,242 ft., for a daily potential of 230 bbl. daily.

Sun's third test will be drilled southwest of the second well, in the John Lane Survey, A-557, on a 1,048-acre tract.

East Pine Mills . . . L. A. Grelling 2 Mary Saner confirmed production to a recent Woodbine sand discovery 3½ miles east of Pine Mills townsite in Wood County. The 2 Saner pumped 165.7 bbl. of low-gravity oil a day from perforations at 5,409-13 ft.

A second attempt to find oil in the Paluxy sand in the Midway Lake field of Wood County is under way at B. F. Phillips Jr. 2 J. B. Cox, located in the W. H. Secrest Survey, northeast of Quitman. Projected depth is 7,200 ft. First attempt was by Morris Coats, approximately ½-mile southwest of the 2 Cox.

GULF COAST

New Oil-Producing Area Found in Refugio County

Discovery of a new oil-producing area, located ¾ mile north of the Refugio-Fox field, northeast of the town of Refugio, in Refugio County, lower Gulf Coast, is indicated by drill-stem-test showings obtained by Sam E. Wilson, Jr., in his 2-F Jamie Hynes, John Malone Survey.

Showings were in sand in the Tom O'Connor series, topped at 5,939½ ft. Two tests were made, the first at 5,940-45 ft., getting 1,050 ft. of oil in 10 minutes with bottom-hole pressure of 1,050 psi., and the second at 5,945-60 ft., in which oil flowed. Tests were made through ¼-in. chokes. In the second test, oil was at the surface in 20 minutes. Bottom-hole pressure, flowing, was 1,745 psi. at the start, and 1,656 psi. at the end. Gravity of the oil was 35.2°.

Sheridan Gets Deeper Pay

A new and deeper gas-distillate producing reservoir has been opened in the Sheridan field, in Colorado County. Discovery well is Shell Oil Co. 2 Ackley, W. L. Platt Survey, A-831, which, on a 10-hour production test through ⅜-in. choke, flowed at the rate of 5,500,000 cu. ft. of gas per day with 37 bbl. of condensate per million cubic feet. Tubing pressure gaged 3,325 psi. The pay, in the Wilcox "R" series, is open through casing perforations at 10,689-748 ft. and 10,774-99 ft. Previous deepest pay in the field is in the "Q" sand at depths ranging from 10,089 to 10,398 ft.

NORTH TEXAS

Montague and Grayson Counties High on Activity

Drilling for conglomerate and Strawn production has set the work pace over the past several months in Montague County, and in Grayson County the addition of Pennsylvanian-Strawn oil as a new pay in the older and deeper fields, plus new discoveries and extensions, has contributed to a fairly steady and high level of operations.

Montague County . . . Active operations included 10 wildcats and 23 development tests. New locations staked were on the same scale, being 10 for wildcats and 24 in fields.

A breakdown on total operations, by fields,

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is: Engle-conglomerate, 1 active well; Engle-Strawn 5 locations, 5 active; Waggoner-conglomerate 1 location 2 active; Richardson-Mueller 1 location, 1 active; Naomi 1 location; Nacona 1 active; North Nacona 1 location; Hildreth 2 locations; Kennedy-conglomerate 1 location; Mueller 1 location; Jadee-conglomerate 2 locations, 1 active; Queens Peak 1 location, 1 active; Hundley-conglomerate 1 active; Lewis-Stuart Caddo 1 location; Milam-conglomerate 1 active; Miami-Fenoglio 1 location; Ulbig 1 active; Saunders-conglomerate 1 location; Bryant 1 active; Underwood-Ray 1 location, 3 active; Ritchie-second conglomerate 1 active; East Ringgold-conglomerate 2 locations, 1 active; Reznick 1 location, 1 active; Montague regular 1 location, and Etter 1 active.

New field... Miami Operating Co. 1 R. L. Hancock, 6 miles southeast of Bowie, was reentered and drilled from old total depth of 5,838 ft. to 5,971 ft. and completed as a conglomerate discovery. Completion potential was 115.5 bbl. of 44° oil through 14/64-in. choke, from casing perforations at 5,920-34 and 5,937-43 ft. The section was acidized with 3,000 gal. The well was originally drilled dry in 1951.

New pay... L. W. Barrett et al 1 H. D. Field, Jr., William Long Survey, established Strawn production on the east flank of the Hundley-Bend conglomerate field. Completion potential was 162.5 bbl. of 41° oil a day through ¼-in. choke through perforations at 5,163-98 ft.

The Texas Co. 3 J. A. Cantwell, northwest of Bowie in the Boedecker area, plugged back to a new pay section at 6,135-50 ft., where it flowed 160 bbl. of oil a day through 14/64-in. choke.

Exploration... F. Kirk Johnson 1 Alexander heirs has been located in Block 29, J. Y. Casstillo Survey, 5 miles north of Belcherville. Contract depth of 6,000 ft. should test the conglomerate.

Blackwell Oil & Gas Co. has staked location for 1 B. C. Rich, 2½ miles northwest of Belcherville, in the J. H. Bostick Survey, A-66. Projected depth is 6,000 ft. and location is 1½ miles southwest of National Association 1 Bonnie Rich, recent conglomerate discovery.

Grayson County... S. M. Aronson 1 Fred Reynolds, discovery prospect 1½ miles east of Tioga, was waiting on Hydrafrac treatment before making potential test. The well drilled sand with oil shows from 3,267-74 ft., and a drill-stem test of the section recovered 50 ft. of clean oil and 40 ft. of heavily oil-cut mud.

Location has been staked for a northeast offset to the above discovery, as S. A. Winfrey 1 A. C. Cheatham.

Superior Oil Co. will drill a confirmation test southwest of L. O. McMillan 1 Suddath Brothers, recent discovery of the McMillan-Pennsylvanian field, 8 miles north of the town of Whitesboro. Projected depth on the Superior well is 9,000 ft. McMillan was drilling ahead on a west offset to his discovery.

Howell, Holloway and Howell, Dallas, have staked location for 1 E. H. Parker in the Asa Hartsfield Survey, A-491, southwest of the Whitesboro townsite. Projected depth with rotary of 5,600 ft. will seek the same pay horizon as found in the Sadler-Pennsylvanian, 6 miles to the northeast.

Activity... A count of Grayson County's active rigs and locations shows seven wildcats drilling and four in the location stage. Field operations totaled 32 new locations and 20 active wells. By fields, these were:

Sherman 12 locations; East Sherman 9 locations, 1 active; North Sherman 1 location; Mulder-Oil Creek 1 active; North McMillan 1 active; Webb-Oil Creek 2 locations, 1 active; Mackey-Strawn 1 location, 2 active; Sandusky 2 locations; Sandusky-McMillan 2 locations, and Sadler-Pennsylvanian 2 locations, 4 active.

SOUTHWEST TEXAS

A new shallow-sand pool, producing a Mirando-type, 24°-gravity crude oil, has been opened 7½ miles east of Gonzales, in Gonzales County, with the completion by Producers Corp. of Nevada of its 1 Johnson, in the W. T. Williams Survey. The well pumped 56 bbl. of oil per day from casing perforations at 1,960-65 ft. Total depth is 2,019 ft.

CALIFORNIA

Union Has Potential Field Discovery at Tejon Ranch

Union Oil Co. apparently has scored a hit with its first test on the 5,000-acre block it leased last December from Reserve Oil & Gas Co. at Tejon Ranch, southeast San Joaquin Valley.

Started as an Eocene test, 46-24 Reserve-Kerr has been bottomed at 7,076 ft., where 7-in. casing was being run, after a formation test at 6,847-6,957 ft. showed good prospects for a 42°-gravity crude discovery. About 5,460 ft. of slightly muddy oil and 420 ft. of salt water were recovered after the tester had been open 1 hour. Production is believed to be from the Tecuya zone, Oligocene age, which produces from a depth of about 1,600 ft. at Tejon Hills, 2½ miles east.

Union has not released geologic data, but

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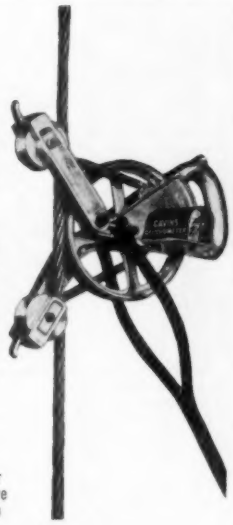

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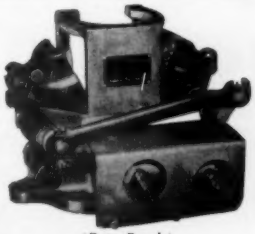

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It Must Be Right

some scouts were of the opinion Eocene rocks were missing and that basement was encountered after leaving the Oligocene . . . as is the case at Tejon Hills. Location of the wildcat is in SE NE SW 24-11n-19w, about 2¼ miles northeast of Tejon Ranch field.

Bitterwater Field Extended

Bitterwater field of San Benito County, discovered by W. W. Holmes 1 O'Connor last May, was given a ¼-mile southeast extension. Oceanic Oil Co. 5-3 O'Connor, in NW NW 3-18s-9e, was completed pumping about 100 bbl. daily of 28°-gravity crude. Production was from a nonmarine Pliocene zone at about 1,500 ft. The operator's 4 O'Connor in SE SE 33-17s-9e was completed for similar initial production as a south offset to the discovery.

MISSISSIPPI

Another Chickasaw Test Encounters Gas Shows

Significant gas showings have been encountered by Vaughey & Vaughey at their 1 U.S.A., another rank wildcat test, located in 9-12s-4e, in northern Chickasaw County, in the Paleozoic area of northeastern Mississippi.

Showings were in the Evans zone of the Mississippian Chester. Top of the zone was logged at 2,405 ft. Two drill tests, one with bottom at 2,422 ft. and the other with hole deepened to 2,443 ft. got gas flows with pressures ranging up to 620 psi. through ⅛-in. choke.

The well logged top of the Mississippian at 1,325 ft., the Carter zone at 1,785 ft., and the Sanders zone at 1,940 ft. A drill-stem in the latter zone at 1,953-72 ft. got water.

Showings have been passed up for the time being with hole being deepened through the Chester.

Location is 15 miles northwest of Carter Oil Co.'s new gas-condensate discovery well 1 Baskin heirs, now being completed in the Treblock area, in the southeastern part of the same county.

About 4 miles to the southwest of the Vaughey & Vaughey well, Sinclair Oil & Gas Co. is starting a Devonian test, its 1 Epperson, in 13-12s-3e. Projected depth is 3,500 ft., or 50 ft. in the Tuscumbia lime.

APPALACHIAN AREA

PENNSYLVANIA

Interest in the Pine Township area of Clearfield County continued to mount in the past week when it was announced that 1 State of Pennsylvania (Tract C) of Manufacturers Light & Heat Co. had encountered its first marker formation, the Tully limestone, at a depth of 6,300 ft. (elev. 2,136).

This test is the most northeasterly of three tests located on the Chestnut Ridge anticlinal trend. Manufacturers Light & Heat Co. is drilling at a depth of 4,000 ft. on 2 State of Pennsylvania (Tract C). Location is 2½ miles southwest of No. 1 test.

New York State Natural Gas Co. is reportedly moving in a rotary rig on location about 3 miles southwest of 2 State of Pennsylvania (Tract C).

Pine Township area is about 13 miles southwest of Benezette Township, Elk County activity and 20 miles southwest of Driftwood Oriskany field.

Deep Rock Oil Corp. 1 Walizer in Greene Township, Clinton County, is drilling ahead after testing interval from 1,944-56 ft. It was disclosed that no shows of gas, oil or saltwater were found.

OHIO

Mutual Oil & Gas Co. 7, Wheeler Johnson, Section 4, Fallsbury Township, Licking County, a further small extension to Mt. Zion pool, had a very good showing of oil with 200,000 cu. ft. gas natural, but apparently bridged after shot and flowed 75 bbl. in 24 hours with no increase in gas. Clinton sand was logged at 2,748-2,805 ft.

Mid East Oil Co. has started its wildcat Clinton sand test on 1 H. E. Miller, Lot 2, Berlin Township, Holmes County.

WILDCAT COMPLETIONS

SOUTHWEST TEXAS

Aransas County: The Texas Co. 1 State, State Tract 113, Aransas Bay. Dry. TD 10,227 ft.

Atascosa County: Big Six Drilling Co. 1 Nisbett, B. Littleton Survey 1,610, A-1562. Dry. TD 3,766 ft.

Cameron County: Gulf Coast Leaseholds, Inc., 1 Schussler et al, Ojo de Agua Grant, Block 6. Dry. TD 10,986 ft.

Dimmit County: Howeth & Mason 1 Marmion, William Votaw Survey 4, A-30/378. Dry. TD 5,015 ft.

Duval County: Southern Minerals Corp. 5-A Denman, LaCopita Farm & Garden Tract 5. Dry. TD 5,782 ft.

Frio County: Henry C. Slavik 1 Winters, I & GN Survey 19, A-426. Dry. TD 3,452 ft.

Hidalgo County: Kirby Petroleum Co. 1 Goedrich, Section 3, League 2, G. O. Newman Subd., Hidalgo County School Land. Dry. 5,612 ft.

Jim Hogg County: Caroline Hunt Trust 1 Silver Lake Ranches, Block 2, Fowler & Ranking Subd., El Sordo Grant. Dry. TD 3,849 ft.

Jim Wells County: Monterey Exploration Co. 1 Cox, Block 28, J. B. Dibrell Subd., Casa Blanca Grant. Dry. TD 6,000 ft.

*H. R. Smith 2 Nina Adams estate, Los Presenos Grant, A-281. IP 80½ BOPD, 6/64-in., 38°, Frio 4,981-86 ft. TD 5,490 ft. Elev. 168 ft. New pay in North Magnolia field.

Nueces County: W. M. Bevly 2 Bluntzer, Lot 6, Bluntzer Partition. Dry. TD 6,427 ft.

La Gloria Corp. et al 1 State-Red Fish Bay, Tract 334 in Corpus Christi Bay. Dry. TD 8,850 ft.

San Patricio County: W. M. Bevly 1 Fee, Section 7, Cubbage & Miller Subd. (Northwest Odem area). Dry. TD 5,847 ft.

Ralph Lowe 1 McRae, D. Murphy Sur., A-367 (1 mile north of Willimar field). Dry. TD 4,825 ft.

Plymouth Oil Co. 1 First National Bank of Houston, Juan de la Garza Sur., A-7. Dry. TD 5,775 ft.

*Superior Oil Co. 2-1 Minnie Welder, Sec. 2, Welder Ranch Subd. IP 86 BOPD, 7/64-in., 38.2°, Frio 5,688-96 ft. TD 7,754 ft. Elev. 61 ft. New field.

*Starr County: Jack Butler 1 Scott & White Hospital, Tracts 154 and 155, Porcion 39, Ancient Jurisdiction of Reynosa. IP 2 BOPD, perforated sand 3,668-69 ft., TD 3,767 ft. Elev. 283. Extends new, unnamed pool.

Travis County: Grady Peeler 1 Alexander, Michael Green Sur. Temporarily dry. TD 1,005 ft.

Willacy County: Humble Oil & Refining Co. 5 Sauz Ranch-Nopal, Share 64, Juan de Carricitos Grant. Dry. TD 11,000 ft.

WILDCAT COMPLETIONS

TEXAS GULF COAST

Bee County: Third M. E. Andrews, Ltd., and Dallas Husky 1 Gonzales, J. T. Molloy Survey, A-43. Dry. TD 4,585 ft.

Colorado County: Sherwood & Blohm 1 Van Werden, GH&H Survey 21, A-248. IP 1,700 M.c.f. daily and 28 BCPD, 12/64-in., Yegua 6,390-95 ft. TD 9,624 ft. New field.

Fayette County: E. and H. Phillips 2 Cockrill, S. M. Williams Survey. Dry, TD 3,945 ft.

Harris County: H & H Operations Co. 1 Siedel, C. D. Cranshaw Survey, A-204, IP 166 BOPD, 8/64-in., 40.1°, Cockfield 5,528-31 ft. TD 5,743 ft.

H. R. Smith 2 Locke Unit, Reels & Trobough Survey, A-59. IP 120 BOPD, 8/64-in., 30.5°, Frio 5,755½-59½ ft. TD 7,010 ft. New pay in Clinton field.

Texas State Drilling Co. 1 Fleming, HT&B Survey 1, A-391. Dry. TD 8,205 ft.

Jackson County: Salt Dome Producing Co. 1 Hodges et al, Section 35, 1st Subdivision, LaWard Farm Tracts. IP 45 BOPD, ⅛-in., Frio 5,635-36 ft. TD 8,446 ft. New field.

Jefferson County: Progress Petroleum Co. of Texas 1 French et al, W. B. Dyches Survey, A-17. Dry. TD 7,415 ft.

Liberty County: G. S. Hinkle and C. B. Webster et al 1 Broussard, S. D. Joscelyn Survey, A-69. Dry. TD 8,744 ft.

Stanolind Oil & Gas Co. 1 Neal et al, Samuel Strong Survey, A-110. Dry. TD 8,815 ft.

San Jacinto County: Stanolind Oil & Gas Co. 1-B Langham, J. D. Martinez Survey, A-177. IP 2,300 M.c.f. daily, 16/64-in., Wilcox 10,086-100 ft. TD 12,502 ft. New pay in Urbana field.

Victoria County: Houston Oil Co. and Second M. E. Andrews, Ltd., 1 O'Connor et al, C. Birmingham Survey, A-458. Dry. TD 4,910 ft.

Pan American Production Co. 1 Becker, Fernando de Leon Grant, A-67. IP 5,800 M.c.f. daily, Frio 6,562-64 ft. TD 7,005 ft. Extends Inez field.

Wharton County: Commercial Petroleum & Transport Co. 1 Reynolds, WCRR Survey 66, A-485. IP 23,000 M.c.f. daily, open flow, sand 5,124-31 ft. TD 5,791 ft. New pay in Crescent field.

EAST TEXAS

Cherokee County: D. D. Feldman 1 F. L. Diamond, Jose Pineda Sur., A-40. Dry. TD 5,210 ft.

Houston County: Carter-Jones Drilling Co. 1 S. R. Wall, Daniel McLean Sur., A-57. Dry. TD 5,956 ft.

Leon County: Rancho Oil Co. 1 T. Z. Shadix, N. G. Allen Sur. Dry. TD 7,731 ft.

Wood County: Watburn Oil Co. 1 T. L. Bellomy, M. A. Mesa Sur., A-385. Dry. TD 5,379 ft.

WEST CENTRAL TEXAS

Brown County: C. C. Craig 1 Hub Maeldin, Sec. 205, A. Arroch Sur. Dry. TD 750 ft.

Callahan County: E. L. Doheny 42 C. B. Snyder, Sec. 42, BBB&C Sur. Dry. TD 4,508 ft.

The Texas Co. 1 Robert McDonald, Sec. 112, BBB&C Sur. Dry. TD 4,441 ft.

Ungren & Frazier 11 Elma Jackson, Sec. 17, ETRR Sur. Dry. TD 1,251 ft.

Woodson Oil Co. 1-A George, Sec. 69, BOH Sur. Dry. TD 666 ft.

* Coleman County: Coronet Oil Co. 2-37 Morris, 37-2-GH&H. IP 949 BOPD, ½-in., 44°, Morris sand 2,551-61 ft. TD 2,591 ft.

* Cree Oil & Exploration Co. 1 Sealy & Smith, GH&H Sur. IP 548 BOPD, 28/64-in., 40°, Morris sand 2,542-50 ft. TD 2,582 ft.

* Hovgard & Fitzgerald 1 Eulys Jackson, 91-2-GH&H. IP 316 BOPD, 16/64-in., 44°, Gray sand 3,163-71 ft. TD 3,227 ft.

* Miller & Banks 3 G. D. Odom, Sec. 739, A. Quigley Sur. IP 132 BOPD, 16/64-in., 45°, pay 2,098-2,106 ft. TD 2,140 ft.

* J. J. Rogers et al 2 J. H. Beall, 294-54-Wm. Woolsey Sur. IPP 30 BOPD, 43°, sand pay 1,030 ft. TD 1,040 ft.

Rowan & Hope 1 Cecil Horne, Sec. 77, HT&B Sur. Dry. TD 3,534 ft.

Haskell County: AB-Tex Drilling Co. 1 Russell Rainey, Sec. 122, D. J. Woodleif Sur. Dry. TD 4,620 ft.

Jones County: B. C. Byars 1 R. J. Camp, Sec. 250, S. M. Hale Sur. Dry. TD 2,549 ft.

Sojourner Drilling Co. 1 A. R. McBay, 37-1-BBB&C. Dry. TD 3,167 ft.

Shackelford County: West Central Drilling Co. 1-43 J. H. Nail Estate, Sec. 43, ETRR Sur. Dry. TD 1,130 ft.

West Central Drilling Co. 1-97 J. H. Nail, Sec. 97, ETRR. Dry. TD 1,487 ft.

Taylor County: Robert Mims 2 H. B. Chambless, 41-19-T&P. Dry. TD 5,582 ft.

NORTH TEXAS

* Archer County: Blackwell Oil & Gas Co. 1 W. B. Ray, W. C. Winters Sur., A-663. IP 103 BOPD, 10/64-in., 44° Mississippi lime 5,287-94 ft. TD 5,294 ft.

W. F. Bockhoff 2 O. Calvin, 1-A443-SF&W Sur. Dry. TD 1,109 ft.

Wm. L. Soddy 1 J. S. Walsh, TE&L Sur. 2417. Dry. TD 1,442 ft.

Baylor County: Archer Drilling & Production Co. 1-D Mills, TE&L Sur. 2414. Dry. TD 1,436 ft.

Cooke County: Snuggs & Neal 1 M. D. Sissney, Asa Hartfield Sur., A-438. Dry. TD 4,750 ft.

Denton County: F & M Drilling Co. 1 J. R. Wilson, J. C. P. Melton Sur., A-802. Dry. TD 2,914 ft., Ellenburger 2,844 ft.

James L. Papadakis 1 M. L. Holland, J. C. P. Melton Sur., A-802. Dry. TD 2,862 ft., Ellenburger 2,847 ft.

Grayson County: Howell, Holloway & Howell 1-A Hutchinson, Samuel Stewart Sur., A-1069. Dry. TD 7,956 ft.

Jack County: L. T. and Bobby Burns 2 J. M. Bloodworth, Blk. 8, M. Anderson Sur. Dry. TD 5,460 ft.

* J. A. Cato 1 Birdwell Lease, M. Mabin Sur., A-413. IP 840 BOPD, 32/64-in., 42°, Caddo 4,226-36 ft. TD 4,558 ft.

Bridwell Oil Co. 1 Johnson Bros., Earl Pearce Sur., A-467. Dry. TD 5,204 ft.

Russell Maguire 1 Worthington, SA&MG Sur., A-582. Dry. TD 3,437 ft.

Walter Plemmons Production Co. 3-S. Myrtle Burt, D. O. Kay Sur. Dry. TD 435 ft.

* Walter Plemmons 2-S Myrtle Burt, D. O. Kay Sur. IPP 31.5 BOPD, pay 369-385 ft. TD 385 ft.

Montague County: J. K. Bailey et al 1 J. B. Irons, W. Miller Sur., A-495. Dry. TD 6,028 ft.

* L. W. Barrett 1 H. D. Field, Jr., Wm. Long Sur., A-1392. IP 162.5 BOPD, ¼-in., 40°, conglomerate 5,163-98 ft. TD 6,650 ft.

Cox Drilling Co. 1 P. B. Vann, W. Tullins Sur., A-736. Dry. TD 6,732 ft.

Carroll E. Sherman 1 Arch Durham, 47-A532-MEP&P. Dry. TD 4,169 ft.

Wichita County: Henry Grace Production Co. 1-B Neva R. Temple, Blk. 9, Palo Pinto CSL. Dry. TD 1,325 ft.

* Joe J. Moore 1 Grace Jennings Farm, 12-A473-HT&B. IPP 29 BOPD, pay 824 ft. TD 832 ft.

F. J. Pounds 1 Pounds-Lee, Blk. 29, Woodruff Heights Addition. Dry. TD 2,006 ft.

Wilbarger County: R. Clay Underground 1

WILDCAT COMPLETIONS

W. T. Waggoner, 35-3-H&TC. Dry. TD 2,005 ft.

Young County: C. B. Christie 1 O. W. Anderson, Blk. 20, Young CSL, A-1284. Dry. TD 3,610 ft.

A. R. Dillard 1 J. S. Carter, A. Speed Sur., A-2296. Dry. TD 4,295 ft.

Ted A. Norwood 1 J. C. Vaughn, Sec. 3, T&NO Sur. Dry. TD 2,607 ft.

WEST TEXAS

Andrews County: Fullerton Oil Co. 1 University, 29-1-University. Dry. TD 10,826 ft., elev. 3,115 ft., Pennsylvanian 8,724 ft.

* Humble Oil & Refining Co. 1-Q State, 15-8-University. IP 418 BOPD, 44°, ¾-in., Devonian 12,509-31 ft., TD 12,533 ft. New pool.

* Coke County: Lion Oil Co. 1 Edward, 365-1A-H&TC. IP 196.3 BO 16 hours, 10/64-in., 49°, Ellenburger 5,760-65 ft. TD 5,940 ft.

Culberson County: Deed Oil Co. 1 State, 7-45-PSL. Dry. TD 156 ft.

* Dawson County: Ponder Oils, Inc. 1 M. C. Lindsey, 109-M-EL&RR. IP 115 BOPD, 42°, Pennsylvanian reef 8,566-71 ft. TD 8,589 ft.

Gaines County: Rowan Drilling Co. 1 G. D. Norman, 9-C45-PSL. Dry. TD 8,312 ft., elev. 3,199 ft., Wolfcamp 9,104 ft.

Sinclair Oil & Gas Co. 1 Luther Lee, League 284, Schleicher CSL. Dry. TD 11,897 ft., elev. 3,090 ft., Pennsylvanian 10,130 ft.

* Texas Crude Co. 1-4 Forest-Dunbar, 4-A28-PSL. IP 4,030 M.c.f. daily, ½-in., San Andres 4,335-59 ft. TD 4,375 ft.

* Hockley County: Stanolind Oil & Gas Co. 1 B. E. Thompson, 27-21-McCulloch CSL. IP 208 BOPD, ¼-in., 42°, Pennsylvanian reef 9,875-9,908 ft. TD 9,908 ft. New pool.

* Loving County: Jay H. Floyd 1 W. D. Johnson, 2-57-T&P. IP 58 BOPD, 20/64-in., 42°, sand pay 3,106 ft. Extends Chapman-Webb.

McCulloch County: Aldridge & Stroud Production Co. 1 Rice, Sec. 1135, Hiendich & Barling Sur. Dry. TD 837 ft.

Reeves County: Phillips Petroleum Co. 525-A strat test, 11-C18-PSL. Dry. TD 4,083 ft.

* Schleicher County: Sinclair Oil & Gas Co. 1 University, 22-54-University. IP 342 BOPD, 40°, Ellenburger 7,780-8,045 ft. TD 8,045 ft. New pool.

* Upton County: Cities Service Oil Co. 1-B Noelke, 4-A-MK&T. IPP 12 BOPD, 32°, pay 5,638-51, 5,684-91 ft. TD 6,882 ft.

Sandor Petroleum Co. 1 Alec J. Sabo, 174-E-CCSD&RGNG. Dry. TD 4,351 ft.

* Yoakum County: Marlowe Oil Co. 2 R. L. Moore, 486-D-J. H. Gibson Sur. IP 175 BOPD, 33°, San Andres 5,307 ft. TD 5,468 ft. Extends Ownby pool.

SOUTHEAST NEW MEXICO

Eddy County: Carper Drilling Co. 1 Chadwick, 9-23s-27e. Dry. TD 2,131 ft.

Lea County: Humble Oil & Refining Co. 2 Federal - Elliott, 33-15s-34e. Dry. TD 13,513 ft., elev. 4,098 ft., Bend 12,176 ft., Strawn 13,470 ft.

NORTHERN NEW MEXICO

Rio Arriba County: Airfleets, Inc. 1 Maestas, SE NW SE 20-25n-1e. Dry. TD 5,026 ft. Dakota 4,861 ft.

San Juan County: Phillips Petroleum Co. 1 Navajo, N½ SE SE 5-30n-17w. Dry. TD 8,175 ft. Igancio 8,172 ft.

* Sandoval County: Albuquerque Associated Oil Co. 1-X Navajo, NW NE SE 22-18n-4w. 594 M.c.f. of gas. TD 994 ft.

San Miguel County: Newton R. Roberts 1 McCune, C NW NE 22-11n-13e. Dry. TD 3,113 ft. granite.

ILLINOIS

Clark County: Griffin & Milam 1 Dawson, NW SW NW 19-12n-13w. Dry. TD 762 ft.

Edwards County: V. R. Gallagher 1 Cowling, NE SW SE 16-1s-14w. Dry. TD 3,114 ft.

Effingham County: Calvert Drilling Co. 1 Pickens, SW NE SE 23-7n-7e. Dry. TD 2,948 ft.

Fayette County: Drilling & Exploration Co. 1 Ray, SE NW NE 35-6n-1w. Dry. TD 2,994 ft. Dutch Creek 2,916 ft.

Gallatin County: G. L. Reasor 1 Rister, SW NW NE 31-7s-9e. Dry. TD 3,100 ft. St. Genevieve 2,910 ft.

Hamilton County: National Association 1 Johnson-McPeak Commission, SE SE SE 9-6s-7e. Dry. TD 3,405 ft. McClosky 3,356 ft.

Jackson County: R. L. Russell 1 McElvain, NW SW SW 21-8s-2w. Dry. TD 1,963 ft.

Marion County: Drilling & Exploration Co. 1 Walker, SW SW SW 30-4n-1e. Dry. TD 1,627 ft. St. Genevieve 1,583 ft.

Moultrie County: National Association 1 Bareither, SE SE SE 12-12n-6e. Dry. TD 2,247 ft. McClosky 2,228 ft.

Montgomery County: O. A. Reed 1 Knag, NW SE SW 18-8n-4w. Dry. TD 1,870 ft. Devonian 1,768 ft.

Wayne County: J. W. Steele 1 Gregory, NW NW NE 6-2s-9e. Dry. TD 3,404 ft. McClosky 3,376 ft.

(Continued on page 208)

OIL FINANCING

Our technical and financial knowledge of the oil industry is available to principals of independently or family owned oil and gas properties. If you are contemplating a loan against present production or considering the acquisition or sale of producing holdings, our specialized experience may be helpful.

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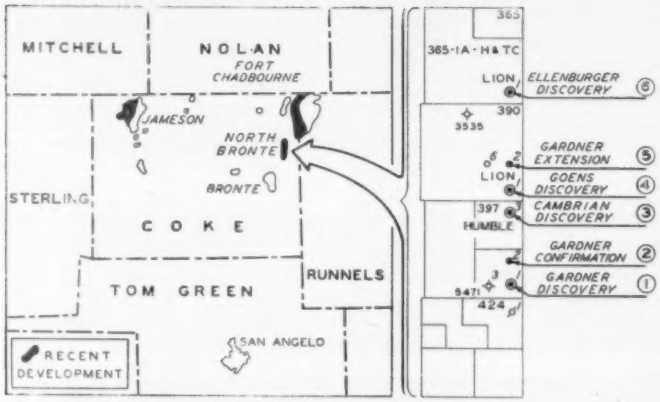


Drilling on the first of a series of indicated highs, from Bronte into Nolan County, has resulted in a new multiplay field at North Bronte.

North Bronte Activity Quickens

by Carl Hoot

DURING the past few weeks North Bronte field of northeast Coke County, Texas, has been the scene of rapid development.

The field was opened in June 1952 with the completion of a Pennsylvanian-Gardner sand well for 300 bbl. of oil daily through small choke. Since then:

. . . The field's second producer, and confirmation well in the Gardner sand pay, completed for around 50 per cent greater production than the original discovery.

. . . A ¾-mile Gardner north extension well came in, running high on that section.

. . . Another Gardner north extension was drilled in for good flowing production, which later completed dually as the Goens limestone discovery for the field.

. . . A flowing Cambrian well, completed in that formation, added a new pay and gave West Texas its first Cambrian production in 11 years.

. . . An Ellenburger discovery was added to the area.

Some of these wells logged additional pays. Drill-stem tests indicated commercial production possibilities from Canyon sand, Palo Pinto limestone, and the Jennings, or upper Gardner sand.

General Setting

Coke County, situated along the edge of the eastern platform, is similar to, or a continuation of the structural framework of Nolan County. *(See Report on Nolan County, The Oil and Gas Journal, February 9, 1953.)*

During the deposition of Pennsylvanian beds, conditions on the eastern shelf were favorable for reef growth in some areas and limestones accumulated over, and flanking structural highs. Many stratigraphic and structural sand traps were formed above and near reef buildups.

The present producing fields of Coke County are in both reef and stratigraphic sand traps. On the east side, Fort Chadbourne is a stratigraphic-trap reservoir, in lower Pennsylvanian beds. On the west, Jameson produces from a Pennsylvanian reef structure, as does Millican pool to the south and Arledge to the northeast.

Extensive drilling over the past 6 months has added approximately 30 per cent to the proved area of Jameson field, mostly from Strawn sands of lower Pennsylvanian age. Limited drilling between Jameson and Fort Chadbourne affords little geologic control, but seismic surveys charted on the Ellenburger indicate a gentle west dip amount to 900-1,000 ft. from Fort Chadbourne to Jameson.

A chain of granite peaks running north from Bronte field is indicated from subsurface and surface geology. This granite "archipelago" continues into Nolan County.

In Bronte field, which produces from Canyon, Goens, and Gardner, the Ellenburger is missing. Early contours on the Ellenburger in North Bronte field show all wells nearly flat on that formation.

North Bronte Field

Humble Oil & Refining Co. opened North Bronte field at 1 Rawlings in SE SE 397-1A-H&TC. Completion potential was 298 bbl. of oil a day through ⅞-in. choke, on perforations at 5,298-5,343 ft., in lower Gardner sand. This well logged oil shows in four of the shallower Pennsylvanian zones but had gas-cut mud and sulfur water on drill-stem tests in the Ellenburger. On top of the Palo Pinto it was 18 ft. high to Hickock and Reynolds 1 Rawlings, a dry hole 2 miles to the south.

Development . . . Humble 2 Rawlings, second well for the field and north offset, logged oil from the Ellenburger and from five sections in the Pennsylvanian. Completion was in the lower Gardner at 5,312-24 ft., for 569 bbl. of 51° oil a day through ¼-in. choke. It ran slightly high on all pays.

Drill-stem tests of the penetrated section indicated the possibility of a flowing well from all pays. In the Canyon sand at 4,154-75 ft., oil reached the top in 53 minutes and the well was shut in. Recovery was clean oil with no water, plus one joint of oil-cut mud. Other drill-stem tests follow:

Goens lime, 5,027-50 ft.: Oil flowed

TENTATIVE FORMATION TOPS ON NORTH BRONTE FIELD DISCOVERIES AND EXTENSIONS

Map No.		Canyon	Palo Pinto	Goens	Jennings	Lower Gardner	Ellenburger	Cambrian
1	Humble 1 Rawlings	4,150 —2,257	4,535 —2,642	5,040 —3,147	5,178 —3,282		5,574 —3,691	
2	Humble 2 Rawlings	4,140 —2,230	4,525 —2,615	5,026 —3,116	5,164 —3,254		5,535 —3,625	
3	Humble 3 Butner						Missing	5,522 —3,621
4	Lion 1 Mary Rawlings	4,182 —2,276	4,514 —2,608	5,014 —3,108	5,156 —3,250		Not reached	
5	Lion 2 Mary Rawlings		4,570 —2,470	5,066 —4,966		5,350 —3,250	5,694 —3,594	
6	Lion 1 Edward Rawlings		4,606 —2,696			5,403 —3,493	5,747 —3,837	

in 49 minutes, no gage or estimate. Drill pipe unloaded all the way out. Flowing pressure was 805 psi.

Upper Gardner (Jennings), 5,163-76 ft.: An 80-minute test recovered 370 ft. of oil and gas-cut mud plus 1,170 ft. of free oil. Flowing pressure was 200 psi.

Ellenburger, 5,535-50 ft.: Gas in 16 minutes, no oil to the surface during 62 minutes tool was open. Recovery was 2,680 ft. of oil and 20 ft. of oil-cut mud. Operators said the well would flow from the Ellenburger.

Cambrian discovery . . . Humble 3 Butner, located in the northeast corner of Section 397, ¾ mile north of the field discovery, is 5 miles north of Humble 18 Hickman, northernmost Bronte field well to log Cambrian oil.

Completion potential on 3 Butner was 301 bbl. of 52° oil a day through 16/64-in. choke, on perforations at 5,541-53 ft. On derrick-floor elevation of 1,901 ft., top of the Upper Cambrian-Hickory was 5,556 ft. and total depth was 5,606 ft. Drill-stem tests indicated pay throughout the section drilled.

Three wells in Bronte field found oil in the Cambrian, but Humble 3 Butner is the first Cambrian producer for Coke County, and first for West Texas in 11 years. Pecos County reported the first Cambrian well, which has since been depleted.

Characteristics of the Hickory sandstone series, as found in Central Texas, are: 150-250 ft. thick massive, white to buff, fine pebbly sandstone above, and coarse conglomerate below.

North extensions . . . Lion Oil Co. 1 Mary Rawlings, located in the southeast corner of Section 390, represented a 1-mile north extension to lower Gardner pay. Original completion from the regular pay at 5,310-42 ft. was 868 bbl. of 50.6° oil a day, through 16/64-in. choke.

Permission was later granted for dual completion, and on potential test the well flowed 167 bbl. of oil daily through 12/64-in. choke from Goens limestone pay at 5,031-37 ft., establishing a new pay for the area.

Lion 1 Rawlings also logged flowing oil in Canyon, Palo Pinto, and Goens sections. Drill-stem tests were:

Canyon sand, 4,178-93 ft., oil flowed in 69 minutes and was shut in. Drill pipe unloaded all the way out.

Palo Pinto, 4,517-73 ft.: Time was 92 minutes, and drill pipe unloaded while coming out.

Goens lime, 5,012-16 ft.: Gas to top in 14 minutes, oil in 16. Oil in the pipe was reversed out. Flowing pressure reached 1,975 psi. This well logged light shows in the Bluff Creek and Cross Cut sands, but two tests in the Jennings failed.

Lion 2 Mary Rawlings, ¼ mile north of Lion 1 Mary Rawlings, ran high on the Ellenburger, compared with 1 Edward Rawlings, but developed salt water on tests from 5,685-5,707 ft., and on last test to 5,792 ft., total depth. It ran 37 ft. low on the Goens to 1 Mary Rawlings.

After electric logging, operators had made perforations in Goens lime at 5,031-37 and 5,046-55 ft., and in the Gardner sand at 5,371-79 ft. for production tests. A dual completion is planned.

Ellenburger discovery . . . Lion 1 Edward Rawlings, in southeast corner of Section 365, opened the Ellenburger for North Bronte field. On completion test the well flowed 196.35 bbl. of oil in 16½ hours through 10/64-in. choke, on Ellenburger perforations between 5,760-65 ft. Calculated potential was 285.6 bbl. daily.

Previous to completion, drill-stem test at 5,783-93 ft. recovered 3,160 ft. of oil in 2½ hours. Water table was encountered on a test from 5,783-5,800 ft., which recovered 3,000 ft. of oil, 60 ft. of oil and gas-cut mud and 100 ft. of oil-cut salt water. When the hole was packed off and tested at 5,756-83 ft., oil reached the top in 46 minutes.

Dry holes . . . Humble 1 Butner, southwest corner of Section 396, an east offset to the discovery, was drilled dry to 6,516 ft. Location of the failure is on the southeast flank of the structure, but separated by a fault that drops 300 ft.

Humble 3 Rawlings, west offset to the original discovery, was dry at 5,471 ft. It topped the lower Gardner at 5,451 ft. on derrick-floor elevation of 1,901 ft., making it 189 ft. low to the discovery.

North Bronte field is indicative of the potentialities of a long-known trend of highs which runs north from Bronte field across the eastern portion of Nolan County. Multiple pays found in the field suggest greater possibilities for the trend than have been heretofore recognized.

In line with this geological picture is the recent completion at J. D. Wrather, Jr., 1 Davis, southeast Nolan County Ellenburger discovery, 12 miles north of North Bronte and 2½ miles southwest of Northwest Hylton field. This well found the Ellenburger at 6,580 ft., minus datum point of 4,271 ft., and was completed for 354 bbl. daily through small choke.

Canada's Geophysical Activity Constant

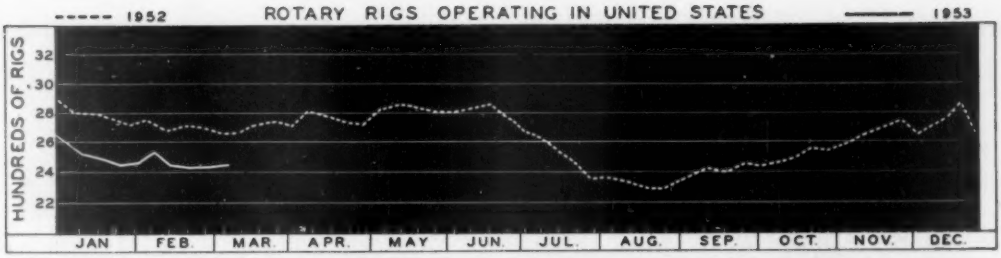
WESTERN Canada's geophysical activity has remained at a constant level for the past few weeks.

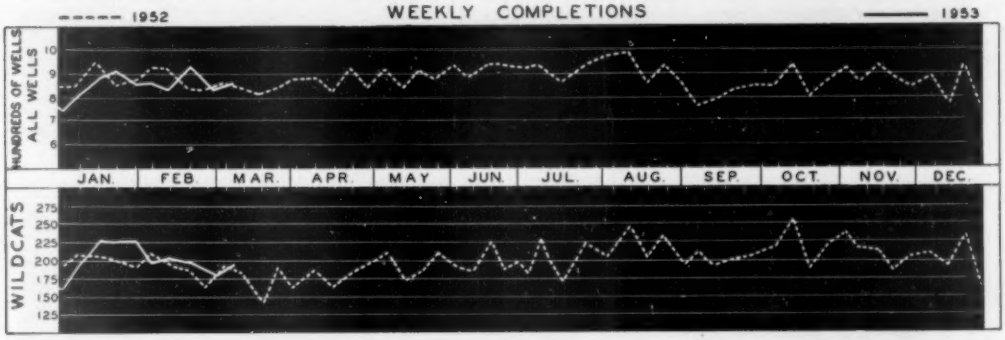
The midwinter slow trend is revealed by an increase of only two crews compared with the year-end activity. There are presently 170 exploration parties operating in the western provinces of Alberta, Saskatchewan, Manitoba, and British Columbia. Since January 1 there has been a noted shift of parties into Alberta and British Columbia from Manitoba and Saskatchewan.

The 170 geophysical parties active in the field are broken down as follows: 160 seismographs and 10 gravity meters. This figure reveals an 8 per cent gain over the 157 active crews operating at this time last year, and 43 per cent over the 1951 figure.

There are 139 active crews in Alberta, including 131 seismographs, and 8 gravity meters. This figure represents a gain of 12 over the December 31 figure. The province of Saskatchewan shows a marked decline in the number of active geophysical units from the 31 crews active on December 31. There are 18 seismic and 2 gravity-meter parties active at present in the province. Geophysical operations in British Columbia continue their expansion with two crews added, making a total of nine active units in the field. There are only two seismographs in the field in Manitoba.

Imperial Oil, Ltd., leads the companies with geophysical activity in western Canada. That company has 20 seismic units in Alberta, and 3 in Saskatchewan. Canadian Gulf Oil Co. is running second with 17 active crews, 15 seismic, and 2 gravity meters. That company has three seismic crews in British Columbia, and the remaining in Alberta. Shell Oil Co. and Texaco Exploration Co. each have 15 active parties in operation in the provinces, with Hudson's Bay Oil & Gas Co., Ltd., and Socony-Vacuum Exploration Co. reporting 12 seismographs in Alberta, and 11 seismic and gravity-meter crews in Saskatchewan and Alberta, respectively. The California Standard Co. has 10 seismic crews in the field in western Canada. About 12 other companies have the remaining active crews in operation.





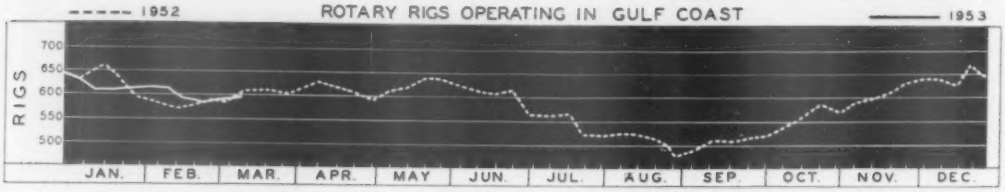
CURRENT STATISTICS

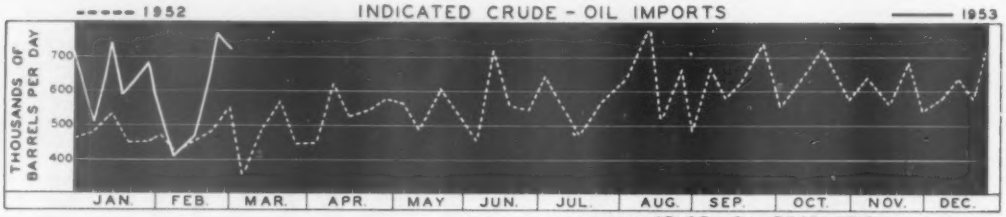
EXPLORATION

WEEKLY WELL COMPLETIONS . . . WEEK ENDED MARCH 7, 1953

	Total of all wells							Wildcat completions and discoveries										
						Mar. 7							Cumulative total, 1953					
	Comp.	Oil	Gas	Dry	Footage	1953	1952	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	11	5	0	*6	15,700	115	120	0	0	0	0	0	0	0	0	0	0
Pennsylvania	29	13	3	†13	40,802	292	292	0	0	0	0	0	0	0	2	5	7
West Virginia	5	0	3	2	13,707	95	112	0	0	1	0	1	0	0	1	1	2
Ohio	19	8	3	¶8	33,265	164	175	0	0	0	0	0	1	0	0	3	4
Indiana	21	4	1	16	34,491	228	194	0	0	0	8	8	5	0	1	53	59
Kentucky	10	1	1	8	17,703	181	234	0	0	0	5	5	4	0	1	33	38
Illinois	37	14	0	23	96,970	351	298	0	0	0	11	11	1	0	0	67	68
Michigan	12	3	0	9	28,812	109	104	1	0	0	4	5	6	0	1	41	48
Kansas	92	46	8	§38	314,209	813	891	1	0	1	10	12	20	0	8	136	164
Nebraska	4	2	0	2	21,256	48	44	0	0	0	1	1	4	0	0	20	24
Oklahoma	140	86	5	‡49	518,251	1,198	1,152	1	0	0	15	16	13	3	5	113	134
Texas	318	190	24	104	1,568,813	2,885	3,387	24	0	5	65	94	166	16	30	721	933
North Central (Dist. 7-B & 9)	117	67	0	50	383,038	1,019	1,074	10	0	0	>2	42	86	0	4	301	391
West (Dist. 7-C & 8)	86	75	1	10	527,125	653	1,050	8	0	1	6	15	29	1	1	115	146
Panhandle (Dist. 10)	13	2	5	6	59,549	143	121	0	0	0	0	0	0	2	0	6	8
Eastern (Dist. 5 & 6)	15	5	3	7	89,495	131	149	0	0	0	4	4	4	0	0	47	51
Gulf Coast (Dist. 2 & 3)	40	19	8	13	257,180	428	509	3	0	4	7	14	26	3	11	100	140
Southwest (Dist. 1 & 4)	47	22	7	19	252,426	511	484	3	0	0	16	19	21	10	14	152	197
Louisiana	37	17	8	12	230,747	471	421	0	0	0	5	5	10	1	5	61	77
Northern	19	11	4	4	57,147	205	229	0	0	0	2	2	1	0	0	25	26
Southern	18	6	4	8	173,600	266	192	0	0	0	3	3	9	1	5	36	51
Arkansas	8	5	0	3	26,720	79	71	0	0	0	2	2	4	0	0	16	20
Mississippi	3	1	0	2	19,651	70	86	0	0	0	2	2	5	0	0	33	38
Southeastern States	2	1	0	1	9,346	29	9	0	0	0	1	1	1	0	0	22	23
Montana	10	4	0	6	71,906	74	31	0	0	0	6	6	1	0	0	20	21
Wyoming	12	8	0	4	57,673	102	104	0	0	0	2	2	1	0	0	25	26
Colorado	7	2	0	5	36,351	88	80	0	0	0	3	3	2	0	1	50	53
Utah	5	1	1	3	29,532	16	17	0	0	0	3	3	1	0	0	11	12
New Mexico	33	5	16	12	162,688	223	165	0	0	1	5	6	4	0	4	30	38
California	45	34	2	9	186,653	440	469	1	0	1	8	10	8	0	2	102	112
North Dakota	4	1	0	3	23,755	46	2	0	0	0	2	2	0	0	0	12	12
Miscellaneous (Ariz.)	1	0	0	1	1,130	8	14	0	0	0	1	1	0	0	0	6	6
Total United States	865	451	75	339	3,560,131	8,125	8,472	28	0	9	159	196	257	20	61	1,581	1,919
Total previous week	836	440	47	349	3,465,738			24	2	8	145	179	229	20	52	1,422	1,723
Total March 8, 1952	840	467	52	321	3,383,855			35	3	3	139	180	264	18	45	1,540	1,867

Service wells included: *6, †11, ‡3, §2, ¶1.

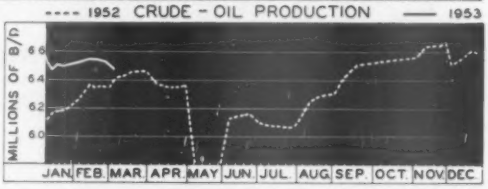


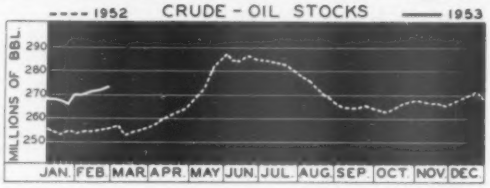


DAILY AVERAGE PRODUCTION FOR WEEK

	March 7			Feb. 28
	Crude oil	Lease condensate	Total	total
Alabama	4,200		4,200	4,200
Arkansas	77,900	700	78,600	78,400
California	988,600		988,600	989,800
Colorado	87,800		87,800	89,100
Eastern	56,000		56,000	54,400
Florida	1,475		1,475	1,475
Illinois	172,200		172,200	167,200
Indiana	34,400		34,400	33,700
Kansas	320,000		320,000	322,700
Kentucky	29,900		29,900	29,100
Louisiana	688,325	42,150	730,475	702,300
North	115,000	2,650	117,650	117,650
South	573,325	39,500	612,825	584,650
Michigan	35,700		35,700	35,800
Mississippi	91,800	4,800	96,600	96,600
Montana	29,700		29,700	30,000
Nebraska	12,300		12,300	12,400
New Mexico	180,375	600	180,975	179,250
Oklahoma	545,300		545,300	539,900
Texas	2,790,800	50,425	2,841,225	2,939,950
Dist. 1	36,800	250	37,050	36,750
Dist. 2	151,675	6,000	157,675	167,475
Dist. 3	459,075	25,700	484,775	497,450
Dist. 4	254,275	6,000	260,275	267,100
Dist. 5	48,500	500	49,000	52,250
Dist. 6	122,725	6,000	128,725	131,900
East Texas field	247,000		247,000	259,900
Dist. 7-B	104,950	100	105,050	111,500
Dist. 7-C	173,750	4,800	178,550	179,150
Dist. 8	931,325	350	931,675	972,150
Dist. 9	188,000	700	188,700	188,300
Dist. 10	72,725	25	72,750	76,025
Utah	5,100		5,100	5,000
Wyoming	204,200		204,200	207,500
North Dakota	11,600		11,600	11,000
Total U. S.	6,367,675	98,675	6,466,350	6,529,775
Change from previous week, down			63,425	
Canada	144,950		144,950	169,750
Total U. S. production January 1-March 7			429,963,700 bbl.	
Same period last year (crude plus cond.)			*422,104,225 bbl.	

*Includes 6,360,760 bbl. condensate.



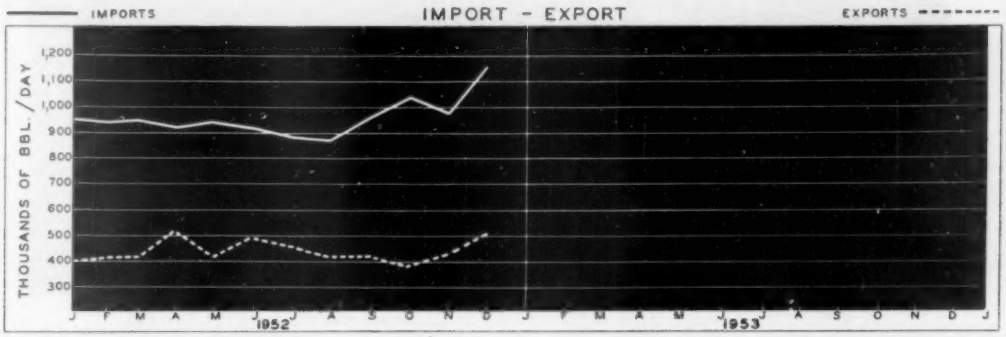


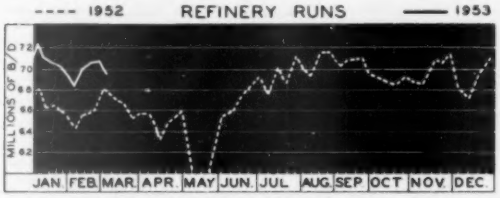
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

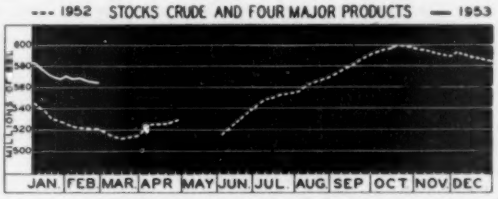
(Thousands of barrels)

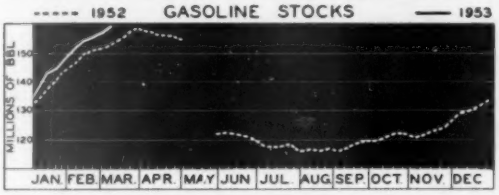
	Feb. 28, '53	Feb. 21, '53	Mar. 1, '52
Pennsylvania Grade	2,327	2,207	2,129
Other Appalachian	2,030	2,051	2,135
Illinois, Indiana, Michigan	10,138	9,873	11,463
Arkansas	2,997	3,033	2,791
Louisiana	16,540	16,117	13,594
North	2,986	2,770	2,738
Gulf	13,554	13,347	10,856
Mississippi	3,797	3,569	3,437
New Mexico	7,465	7,681	7,752
Oklahoma and Kansas	36,478	35,835	39,019
Texas	135,569	135,878	122,669
East Texas proper	11,369	11,255	11,191
West Texas	64,646	64,786	55,668
Texas Gulf	25,828	25,670	25,261
Other Texas	33,726	34,167	30,549
Rocky Mountain	15,802	16,159	13,834
California	32,705	32,401	31,184
Foreign	8,275	7,577	6,445
Total	274,123	272,381	256,452

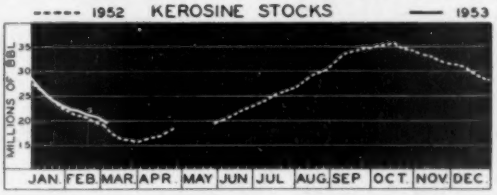
*Bureau of Mines.

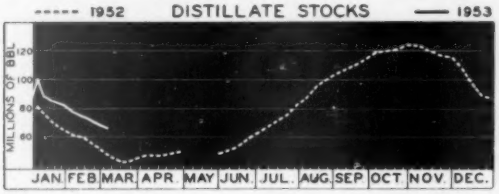


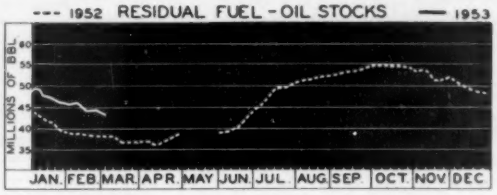










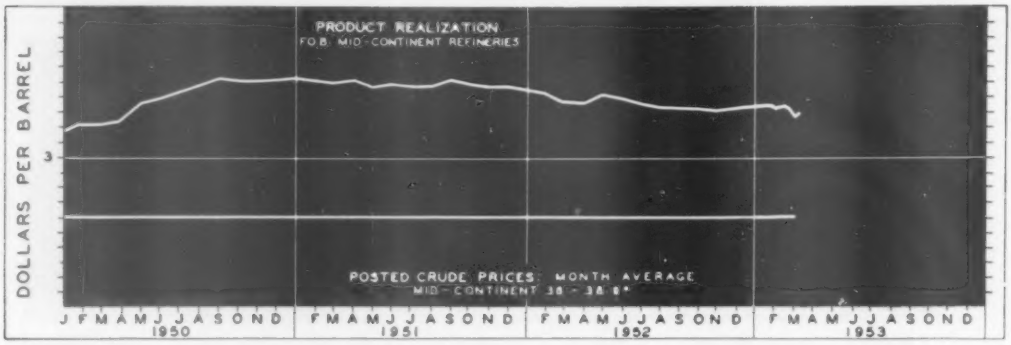


A.P.I. REFINERY REPORT, MARCH 7

(Thousands of barrels)

District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, March 1952: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	1,030	406.8	53.3	272.2	246.7	35,141	8,373	22,836	11,357	940	385.3	44.3	226.6	229.6
Appalachian:														
District 1	105	41.7	8.3	19.3	15.6	4,331	488	1,077	503	109	49.6	5.8	14.8	13.2
District 2	94	44.6	6.7	15.0	17.1	1,791	314	455	169	71	35.2	4.2	11.6	17.6
Ind., Ill., Ky.	1,260	668.3	89.3	222.0	188.4	37,018	4,443	9,986	4,382	1,253	632.6	81.7	228.7	174.8
Okla., Kans., Mo.	579	340.1	17.6	117.7	55.6	17,780	1,128	7,323	1,111	535	293.9	18.2	119.6	63.8
Inland Texas	261	164.0	13.4	49.0	33.6	6,462	335	1,325	885	236	166.3	13.4	40.4	38.0
Texas Gulf Coast	1,738	784.8	160.3	418.3	262.4	21,615	2,469	7,163	6,240	1,705	727.1	145.4	391.6	265.2
La. Gulf Coast	530	262.9	57.0	138.7	61.6	7,979	1,097	3,661	1,381	499	240.3	49.9	143.9	59.0
N. La. and Ark.	84	32.9	8.1	21.6	7.7	3,420	534	1,137	71	71	31.6	6.7	19.2	4.9
Rocky Mountain:														
New Mexico	17	10.0	.....	2.4	3.3	154	.....	30	27	18	10.4	1.0	2.6	4.0
Other Rocky Mtn.	246	119.3	5.0	48.4	41.7	6,850	303	1,558	869	217	101.4	8.7	42.9	46.7
California	1,019	429.0	4.7	146.4	357.0	16,893	359	8,925	16,633	986	395.7	6.6	158.2	356.8
Mar. 7, 1953	6,963	3,304.4	423.7	1,471.0	1,290.7	159,434	19,843	65,476	43,628	6,640	3,068.8	385.9	1,400.1	1,273.6
Feb. 28, 1953	7,090	3,337.1	419.3	1,542.3	1,288.1	157,612	20,550	68,025	44,432	.....	.....	.....	.....	.....
Mar. 8, 1952	6,735	3,092.1	372.6	1,469.1	1,316.7	153,678	17,454	53,554	37,747	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.


PRODUCT REALIZATION
F.O.B. MID-CONTINENT REFINERIES
DOLLARS PER BARREL
3
POSTED CRUDE PRICES: MONTH AVERAGE
MID-CONTINENT 38 - 38.0°
J F M A M J J A S O N D
1950
F M A M J J A S O N D
1951
F M A M J J A S O N D
1952
F M A M J J A S O N D
1953

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate and fuel oil. Realization averaged $3.29 for week ended February 28, $3.27 for previous week, and $3.42 for February 1952. The above trend information is based on volumes and current prices and therefore does not reflect changes in operating costs.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of March 11, 1953. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline, 80-82 octane	10⅛-10½	12.125-12.75	10¾-11
Premium gasoline, 86-88 octane	11⅛-11½	13.25-14.0	11¾-12
42-44 w.w. kerosine	8⅜-8¾	10.40-10.65	9
No. 2 straw fuel oil	7½-7¾	9.50-9.65	8
No. 6 residual	$0.85-1.00	$1.90-2.15	$1.50-1.65

NATURAL GASOLINE

	Group 3	North Tex.	N. La.
Grade 26-70	5½	5	5¼
Grade 18-55	6.60	6.10	6.35

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	12-13
750 vis., No. 3-4 neutral	15-16
2,000 No. 5-6 neutral	17-18

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	21-22
200 vis., No. 3 neutral, 0-10 pp.	12-13

Western Pennsylvania

145-155 vis., 10 p.t. bright stock	27.5
180 vis., 0 p.t. neutral	29.5

WAX

Mid-Continent

132-134 A.M.P.	5.5

TANK-WAGON prices for gasoline in New York and New England have dropped back to the level that existed before the increases by some companies on February 6. When several of the major suppliers failed to go along with the increase, averaging about 0.5 cent a gallon, the companies posting the increase returned to the original postings.

Continuing declines in the spot tanker rates have tended to lower prices for residual fuel in New York Harbor. Charters for the Caribbean-East Coast haul were reported at Maritime Commission base minus 45 per cent. At this rate, No. 6 fuel can be delivered to New York for about $1.75 a barrel based on a price of $1.50 on the Gulf Coast. More material in New York Harbor is reported available at $1.90 for barge delivery. Some suppliers are still quoting $2.00.

A special rail rate for movement of distillate fuel from Oklahoma to the Gulf Coast for tanker lifting is reported to be giving a slight increase to the movement south. The new rate is 28 cents per hundred or a little more than 2 cents a gallon. Since 8 cents a gallon is top price for No. 2 at the Gulf, a Mid-Continent refiner would net less than 6 cents a gallon on this grade of distillate moving to the coast.

A decrease in movement of distillate out of the Gulf Coast as the end of the heating season draws near may bring lower prices on that market. In some cases, the Mid-Continent refiner will want to move to the coast the material that is hardest to sell in the regular market, probably cracked distillates that may be slightly off specification. These distillates will sell for less than 8 cents on the Gulf now and may be even lower within a few months. The netback to the Oklahoma refiner will be reduced by each cut on the coast. The probable net to the Mid-Continent refiner is so low that only distress material will be shipped to the gulf despite the new rail rate.

CRUDE PRICES GRAVITY SCHEDULE

	Signal Hill, Calif‡	Okla. homa, Kansas	Gulf Coast Tex.*	West Tex.†
14-14.9	$1.87	....	....	....
15-15.9	1.93	....	....	....
16-16.9	1.99	....	....	....
17-17.9	2.05	....	....	....
18-18.9	2.11	....	....	....
19-19.9	2.18	....	....	....
20-20.9	2.24	$2.25	....	$2.12
21-21.9	2.30	2.27	....	2.14
22-22.9	2.37	2.29	....	2.16
23-23.9	2.45	2.31	....	2.18
24-24.9	2.53	2.33	$2.56	2.20
25-25.9	2.61	2.35	2.58	2.22
26-26.9	2.69	2.37	2.60	2.24
27-27.9	2.76	2.39	2.62	2.26
28-28.9	2.83	2.41	2.64	2.28
29-29.9	2.91	2.43	2.66	2.30
30-30.9	2.97	2.45	2.68	2.32
31-31.9	3.04	2.47	2.70	2.34
32-32.9	3.12	2.49	2.72	2.36
33-33.9	....	2.51	2.74	2.38
34-34.9	....	2.53	2.76	2.40
35-35.9	....	2.55	2.78	2.42
36-36.9	....	2.57	2.80	2.44
37-37.9	....	2.59	2.82	2.46
38-38.9	....	2.61	2.84	2.48
39-39.9	....	2.63	2.86	2.50
40 and above	....	2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico.

Last general price change represented a 50-cent increase, effective December 6, 1947.

‡Standard Oil Co. of California.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Louisiana:	
Beauregard Parish	2.60
Cotton Valley (distillate)	2.85
Cotton Valley (crude)	2.70
Texas:	
East Texas	2.65
Pecos County (Yates)	2.35
Conroe	2.83
Van	2.48
Pennsylvania Grade:	
Bradford	4.40
Southwest Pennsylvania	3.97
West Virginia	39.1
Illinois Basin	2.77

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87′ Lee C. Moore Cantilever Derrick located East Central Oklahoma. Drilled one well since complete overhaul by Lee C. Moore. 41½′ substructure, steel floor, 4′ drop wings. $8,000.00. Box G-329, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Two hydraulic casing pulling units, in good condition with two tool houses and two late model pick-up trucks. Pipe Pulling, Inc., 629 West Broadway, Phone 475, Stafford, Kansas.

FOR SALE: 1 43 Star spudder complete with tools. Price $6500.00. Four miles east of Delaware, Oklahoma. Call Tulsa 3-0390. After five 54-1488. C. L. Sutton.

1—1000 H.P., 600 KW, 300 RPM, COOPER BESSEMER, Type LTG natural gas engine. 1—500 H.P., 350 KW, 225 RPM, FULTON, Class BGG, natural gas engine. 2—300 H. P., 200 KW, 200 RPM, FULTON, Class 3 BG Diesel Engines. (All 3 phase, 60 cycle, 2300 volts). Units can be seen in operation. 12—300 H.P., 900 RPM, STERLING - VIKING natural gas engines only. Completely rebuilt and guaranteed. MAX E. LANDRY, INC., P.O. Box 2238, Tulsa, Oklahoma. Ph. 72-1519.

FOR SALE: Model P oil well mud pump 6 X 12, A1 condition, can be inspected, ideal for light rotary or reverse circulator. $4500.00. Davon Drilling Company, Oklahoma City, Okla.

FOR SALE: Fort Worth Super J. Spudder, skid mounted, V-Belt drive, 60′ pipe mast, Cummins diesel engine Model-H. Some other equipment if desired. Wilson Drilling Company, Box 5656, Eldorado, Texas.

FOR SALE: 2—New B. J. Multiplex 6 x 8 x 10 pipe line pumps, 1000 Gal. @ 400 ft., maximum head 2000′, List $3468.00 each, Our Price $1250.00 each. Bender Oil Operations, P.O. Box 52, Bakersfield, California.

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SAM SIEGEL
Ph. 4-6512, Shreveport, Louisiana.

FOR SALE

Complete National 100 Rig including 3 PTD-6 Superior Diesel Engines with dual fuel equipment, 136′ Lee C. Moore Mast with 8′ substructure, 2 C-350 Ideal Power Pumps, Ideal Type 548 TC Traveling Block, Type R3 Swivel, and Type MS-20½ Rotary Table. Excellent condition, priced reasonable, located in Montana. Complete inventory upon request.

Box G-341

The Oil and Gas Journal,
Tulsa, Oklahoma

EQUIPMENT FOR SALE

1 OILWELL Steam Pump, 16½ x 7¾ x 20″. This pump is in excellent condition, may be seen at Makin Drilling Company Yard, Hobbs, New Mexico. Makin Drilling Company, Box 1628, Hobbs, New Mexico.

FOR SALE: Jennings, Louisiana, many used steel storage tanks. 100 to 37,000 bbl. Hardware, connections and pumps. Southern Oil Agency, P.O. Box 880, Jennings, Louisiana.

FOR SALE: At Madison, Kansas, a large quantity of ⅝″ and ¾″ sucker rods suitable for reuse, recently reclaimed because of water flood operations, 10c & 15c per foot. Cities Service Oil, Patridge, Bartlesville, Okla.

2—OILWELL 3″ x 6″ Triplex Power Pumps w/ porcelain plungers. 7—75 HP, 440-V, 900 RPM, Open type electric motors. 13—6 groove D-section sheaves 15″ to 34″ diameter. 4000′—1½″ Cement Lined Pipe. Morrison Producing Company, P. O. Box 712, El Dorado, Kansas.

Gaso Duplex 4½″ x 6″ Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Hockdale, Texas
AT-3427—Houston, Texas

FOR SALE
SURPLUS
SHOP EQUIPMENT

1—Lodge & Shipley Hollow Spindle Lathe, 8-⅞″ hole, 25″ Swing, 16′ Bed, Hardened & Ground V-Ways. Purchased new in 1950.
1—Seneca Falls Engine Lathe, 12″ Swing x 6′ Bed. Motor driven through Turner Unit.
1—Bridgeport 8″ Hole Hollow Spindle Lathe. **52″ Swing**, 16′ Bed. Motor driven through Turner drive.
1—15″ R. A. Kelly Company Hydraulic Shaper, Motor Driven.
1—21″ Champion Post Type Drill Press, Motor Driven.
1—400 AMP Lincoln Electric Welder. 220 Volt, 60 Cycle, 3p Motor Driven.
1—Kalamazoo P45 Band Saw. Motor Driven.
1—Buffalo 14″ Post Type Drill Press. Motor Driven.
1—200-Ton Hydraulic Horz. Press. 10′ inside clearance. Motor driven pump.

This is a part of a complete Machine Shop. Location is 2601 Butternut, Abilene, Texas. Inspection may be made at any time. Shop could be readily dismantled and moved or operated at its present location.

PRICED TO SELL

Phone—Wire—Write

Empire Machinery Co.
Box 4028 1613 Tower Petroleum Bldg.
Odessa, Texas Dallas, Texas

EQUIPMENT FOR SALE

WELL drilling equipment, new or used Spudders, rotaries, core & shot hole drills, tools, pipe, bits, blocks, pump jacks, valves. Everything for well drilling and service. Fishing tools rented. Pressey & Son, Pueblo, Colo.

FOR SALE: One 36″x11′ 125# WP Std BS&B Vertical Separator complete w/valves and safety head. One 3 phase 220-440V, 75KW Generating Unit w/all controls built in direct connected to 165 HP GMC Diesel Engine. Phone 9-3193 or box 1724, Billings, Montana.

CASING

IMMEDIATE DELIVERY

5½″ O.D. 15.5# J-55 R2 ST&C Sml. New Casing 8RD API Spec. Racked at Houston, Texas. 191.46 Ton or 24,705 Ft. of Japanese made casing. Will sell all or part at $245 Ton plus cost of shipping, duty, etc., from Japan. Write, call or wire collect to

PAUL KOLLSMAN
Waldorf Astoria Towers, 100 E. 50th. St.
New York City, New York
Phone ElDorado 5-3100

WE OWN AND OFFER FOR IMMEDIATE DELIVERY THE FOLLOWING

Unused DC Generators

12 Only	Single Bearing Units
250 KW	40C Continuous
240-120 Volts	125% Load 2 Hrs. 55C
1042-280 Amps	Size 153HD-M-DP
450 R.P.M.	Compound Wound
Manufactured by Crocker Wheeler Electric	

6 Only	Single Bearing Units
300 KW	40C Continuous
240-120 Volts	125% Load 2 Hrs. 55C
1250 Amps	Frame 102HD-M-DP
1200 R.P.M.	Stab. Shunt Wound
Manufactured by Crocker Wheeler Electric	

1 Only	Single Bearing Unit
300 KW	40C Continuous
120 Volts (NL-FL)	125% Load 2 Hrs. 55C
2500 Amps	Frame CB-208.6B
1200 R.P.M.	Compound Adj. Wndg.
Manufactured by Westinghouse	

1 Only	
400 KW	Instruction Book 5107
120-240 Volts	Drip Proof Enclosure
1200 R.P.M.	Serial 3516 P10
1667 Amps	Single Bearing Unit
Manufactured by Westinghouse	

We have a complete stock of Motors, Generators and Control
CONSULT US FOR YOUR REQUIREMENTS!

C. Kirk Hillman Company
3201 First Ave. So. - Seattle 4, Wash.
ELiot 1361

EQUIPMENT FOR SALE

GAS METERS FOR SALE. Westcott, Foxboro and Emco. Good condition. Geo. R Milner, Box 124, Okmulgee, Oklahoma.

FOR SALE: One double drum Super-Mogul Wilson Spudder, powered by PA-100 International motor. $1500.00. Fox Well Servicing Company, Healdton, Oklahoma.

FOR SALE: 40,000 ft. #1 3½" O.D. standard plain end line $0.55 per ft. 30,000 ft. 4" O.D. flues. Rogers Pipe and Supply Company, Phone 5-8850, Tulsa, Oklahoma.

Save Threads—Prevent Seizure!

ARMITE DRILL COLLAR & TOOL JOINT COMPOUND

ARMITE LABS., 6509 Broad St., Los Angeles 1, Calif.
The Wm. H. Mason Co., 212 N. Denver Ave., Tulsa, Okla.

FOR SALE

1—Building 24′ x 75′, Steel Frame, C. I. Boiler House
1—Engine, 18 x 20 Type 8-190 HP C. G. Cooper (Generator engine)
5—Engines 18 x 20 Type 75-170 HP C. G. Cooper (Compressor engines)
3—5′ x 20′ Riv. Steel Gasoline Storage Tanks
5—10′ x 40′ Riv. & Welded Steel Gasoline Storage Tanks
1—Fractionating Still 30" x 36′, Petr. Eng. Co.
1—Stabilizer, 48" x 30" x 24" x 34′, Tulsa Type.

Compressor cylinders, Braun Heat exchangers, preheaters, Pumps, Motors, scrubber Tanks & volume Tanks.

BANKOFF PIPE & SUPPLY COMPANY
P. O. Box 2301, Tulsa, Oklahoma
Phone 6-2119

NEW
4" O.D. ASPHALT COATED
IRRIGATION TUBING

12 gauge wall with belled ends
10,000 feet available
40 foot lengths

All sizes of pipe and tubing available for oil, gas, water and construction. Send us your requirements.

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2nd and Riverview (X-933)
Kansas City 18, Kansas
THatcher 9243

INTER-COMMUNICATION EQUIPMENT

(Dictograph Products, Inc.)

Manufacturers Type Boxes
1—E-20-E Executive Station—Automatic and or Handset
4—20 Station Boxes—With Handset
6—12 Station Boxes—With Handset
11—Junction Boxes complete with connecting cords.

New Cable (5 Years)
289 Ft. #102 Cable (51 Pair)
100 Ft. #82 Cable (41 Pair)
625 Ft. #66 Cable (33 Pair)

Converted Manufacturers Type Boxes with Handsets
19—14 Station Boxes
1—12 Station Box
2—10 Station Boxes
22—Junction Boxes complete with connecting cords.

Box G-369
THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

EQUIPMENT FOR SALE

TWO FAILING 1500 heavy duty drills with 4½ x 6 pumps, automatic pulldown, and mounted on International trucks. Write P. O. Box 819, Longmont, Colorado. Phone 1333.

FOR SALE: Moore cantilever derrick; Wilson Giant two motor draw works; two pumps, rotary; block and hook. Write Box 3246, Corpus Christi, Tex.

FOR SALE: Wilson Giant Spudder with double mast pole. All tailing-in tools for 5½ and 7 inch. Also rotary equipment used as combination rig. All equipment in A-1 working condition and priced to sell for cash. Call Ray Willis, Phone 924, Mt. Carmel, Ill.

FOR SALE: One Barrel Type Ethyl Lead Plant, Hutex Oil & Refining Company, P. O. Box 2146, Houston, Texas.

FOR SALE: 8—Shriver 42"x42" cast iron filter Presses, Plate & Frame type, 18, 27, and 54 chambers, 1" cake; 15—Sperry 18"x18" cast iron Filter Presses, 11 chambers; 3—#12 Sweetland Filters for 36 leaves on 4" centers. Immediate shipment. Attractively priced. Consolidated Products Co., Inc., 17-20 Park Row, New York 38, N. Y. BArclay 7-0600.

FOR SALE—At Oklahoma City, N-7 Brewster Rig with 3 NKU Waukesha Engines. D-500 Emsco Pump, 127 ft. Lee C. Moore Mast with 7 ft. Substructure, and with or without drill pipe. All in excellent condition and complete in every respect. Box G-347, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: R. L. Dubbledrum Cardwell fully equipped. Oklahoma City, Oklahoma, Melrose 8-5108.

FOR SALE: Franks "2000" Rotary Drill, on tandem lowboy trailer—exceptionally good shape. Contact R. F. Hare, 2018 W. T. Waggoner Bldg., Fort Worth. Ph. FA-4646.

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

MOUNTED Rotary Drilling Rig. Dodge Truck, 1500 feet, Two Men Operate, Fast, Durable, Efficient, Roller Bearing, Money Maker. $5000. Box 106, Seminole, Oklahoma.

CARDWELL R. L. 3 Drum Spudder, equipped with lots of extras, including rotary drive clutch. G.K.U. Waukesha Motor. All in A-1 condition. Just shut down on 7800′ well. Can be seen on our yard in Midland, Texas. Call C. A. Hurst Drilling Co., Midland, Texas, phone 3-3532 or Mr. Vaught 2-2088.

FOR SALE: 6000′ 4½" OD Sonoscoped Drill Pipe, 4500′ 3½" Reg. Drill Pipe. Rotary & Cable Tool Equipment. Giffin & Thompson Supply, Phone 477, Hoisington, Kansas.

FOR SALE: Cardwell, model RL, Beam type cable tool drilling unit. At present in operation in West Central Kansas. Complete inventory and price furnished on request. K & A Drilling Co., Phone 448R or Box 497, Ellinwood, Kansas.

USED ROTARY, cable tools, and production equipment. E. A. Kelly, 3131 S.E. 29th Street, P. O. Box 861, Oklahoma City. Phone Jackson 56407.

FOR SALE: Madison, Kansas, two used 18" x 20" Horizontal Gaso Vacuum Pumps, each $200.00. Cities Service Oil Company, Patridge, Bartlesville, Oklahoma.

FOR SALE at Lima, Ohio, Refinery—Regular accumulations of American Cyanamide M S synthetic equilibrium catalyst UPO Activity 26. The Standard Oil Company (Ohio), Midland Bldg., Cleveland 15, Ohio. R. L. Charles.

EQUIPMENT WANTED

AIRCRAFT RADIO EQUIPMENT Wanted: ARC-1, ARC-3, ART-13 or components thereof. Write or wire Pureflo Systems, PO Box 105, Kearny, N. J.

WANTED: Three engine compound for Wilson Titan drawworks. Makin Drilling Company, Box 1628, Phone 3-3141, Hobbs, New Mexico.

WANTED: One Thrible Jack-knife and substructure. No Junk Wanted. Makin Drilling Company, Phone 3-3141, Hobbs, New Mexico.

EQUIPMENT WANTED

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

HELP WANTED

GRADUATE engineers with gasoline plant experience qualifying them for supervisory and staff positions needed for Venezuela. Write The Carter Oil Company, Box 801, Tulsa, Oklahoma, giving age, education, marital status, and experience. Box G-368, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—Seismograph Party Chief. Must be fully qualified. Age 27-38. A good opportunity for the right man. Box G-348, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMIC Party Chief for work in United States with degree in Geophysics, Geology, or Engineering, age 25 to 35, capable of advancing, in small progressive Contract Seismograph Company. Must be good interpreter. Salary commensurate with ability. Please include education and complete brief of experience in first reply. Replies confidential. Box G-351, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMIC PERSONNEL needed for United States and Canada by well known and expanding contract geophysical company. Address Box E-863, The Oil and Gas Journal, Tulsa, Oklahoma.

PIPE LINE WELDER, at least 4 years' experience in welding on loaded crude lines. Must be able to supervise and direct small maintenance gang in addition to regular duties as welder. Location, North Central Area. Age—25-45. Box G-358, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERS, Executives, Technical Men. Salaried positions—$3600 to $30,000. This confidential service for outstanding men who desire a change of connection. Will develop and conduct preliminary negotiations without risk to present position. Send name and address for details. Tomsett Associates, 434 Frick Bldg., Pittsburgh 19, Pa.

OLD established engineering and contracting firm desires engineer for oil and gas process work. Should have two or three years' experience with operating company. Write stating experience and present position to Box G-363, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE Chemical Engineers and Chemists with or without experience for positions in Research and Development department, located in Tulsa. State qualifications and salary expected. Write Personnel Department, P. O. Box 381, Tulsa 2, Oklahoma.

RESEARCH GEOPHYSICIST to head group doing theoretical and interpretative research in exploration geophysics for major oil company. Location in Mid-Continent Region. Ample opportunity for well-qualified man with advanced training and experience. Please give complete history of education and experience in first letter. Reply will be kept confidential. Address Box G-364, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL Industry Employment Service. 405 Tuloma Bldg., Tulsa, Okla. 4-5974. Tom Robinson, owner. For Technical and Trained Personnel, including LPG.

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

WELL geologist, graduate, minimum six years' experience. One year contract, foreign work. Prefer single man with considerable experience in drilling operations. Liberal salary for man with proper qualifications. Box G-355, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN

By independent Oil operator for Houston location, with legal background and Gulf Coast experience. State qualifications, experience, age, present salary and connections, if employed. All information confidential. Write to

Box G-374, The Oil and Gas Journal
Tulsa, Oklahoma

HELP WANTED

MANY Rocky Mountain Petroleum Industry openings for geologists, engineers, draftsmen, and refinery supts. Write Professional Placement Service, 516 University Bldg., Denver, Colo.

PRODUCTION FOREMAN thoroughly experienced in oil field production for Venezuelan assignment. Should have worked as a production foreman for at least three years and have experience as a roustabout leaderman. Family housing available in six months. If you can qualify give full details in reply to P. O. Box 2819, Dallas, Texas.

GEOPHYSICIST for Caracas, Venezuela, to assist Chief Geophysicist. Must be fully qualified in interpretive work, field supervision, and correlating geophysical information from various sources. Will assist in planning and directing geophysical field program. Should have college degree in geology or geophysics and a number of years geophysical experience in a supervisory capacity. Liberal salary and living allowance. Give full details in reply to P. O. Box 2819, Dallas, Texas.

JUNIOR PETROLEUM ENGINEER for Venezuelan assignment with major oil company. Should have engineering degree and limited field experience. Give full details in reply to P. O. Box 2819, Dallas, Texas.

GAS MEASUREMENT ENGINEER for Caracas, Venezuela. Supervises meter section, calculating procedures, chart clerk and various tests. Should have college degree and minimum of six years experience in gas measurement department of natural gas utility company. Liberal salary and living allowance. Give full details in reply to P. O. Box 2819, Dallas, Texas.

MAN experienced in construction and operation of small Natural Gas Distribution Systems. Registered Engineer Preferred. Permanent location in Southeast. Box G-365, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

COMPLETION and production man experienced in Acidizing, Fracturing and workover desires change. Now employed in West Central Texas. Box G-370, The Oil and Gas Journal, Tulsa, Oklahoma.

QUALIFIED SECRETARY — With extensive oil experience desires position with independent oil company or oil operator. Box G-345, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER, Math. Masters. 4 years P.E. experience, all phases, desires chance to get into teaching. Resume on request. Box G-340, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER, employed, 11 years experience Major company and Service company, drilling and production, field and staff work. Box G-345, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE PETROLEUM ENGINEER: Married, age 32, 7 years experience production and drilling, Gulf Coast area. Desires permanent position w/growing organization. Box G-337, The Oil and Gas Journal, Tulsa, Oklahoma.

MANAGER or assistant manager, 42, truck transportation or wholesale gasoline agency. 13 years' experience independent refinery. Box 322, Big Spring, Texas.

AVAILABLE: Twelve chemical engineers with 3-8 years varied experience in refining, now working for sub-par salaries. Write requirements to Box G-366, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM Engineer, 7 years major company experience, Gulf Coast and West Texas, production, drilling, and reservoir analysis. Employed, married, age 31. Desires position with independent. Box G-309, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No. 1628, Ph. No. 3-3141, Hobbs, New Mexico.

SITUATIONS WANTED

GEOLOGIST—Ph.D. with many years experience in all phases of petroleum exploration and with an outstanding record of successful oil and gas finding. Will be available April 1st for full time work or on a part-time retaining basis. If you need ideas for drilling prospects, this is an excellent opportunity and should be investigated. Box G-373, The Oil and Gas Journal, Tulsa, Oklahoma.

CONSTRUCTION Civil Engineer, Age 45, wishes foreign connection, 20 years experience with 10 years in tropics, 7 years with major company in Venezuela. Qualified to organize and supervise engineering department. Skilled in design and construction of tropical housing, also roads, runways, bridges and other general oil field installations. Speak Spanish, can handle natives. Box G-372, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE Petroleum Engineer, Age 32, married, 9 yrs. diversified drilling, workover, production, reservoir, and gas engineering experience. Desire job including production or reservoir engineering. Will consider any location. Box G-367, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN, one year with major company, wishes to join smaller organization; age 35; familiar with Oklahoma and Denver-Julesburg Basin areas; lawyer; first preference to Rocky Mountain area. Box G-371, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE teacher: completed two contracts in Venezuela, one two year contract in Arabia. Chicago experience in all grades. Available September for other foreign assignments. Box G-359, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS OPPORTUNITIES

WANT half interest small still for straight gas and tractor fuel. Excellent location new field. Jonnum Mfg. Co., Pittsburg, Kansas.

SOUTHEAST NEW MEXICO INDICATED OILFIELDS

Engineering reports based on factual evidence developed by drilling & seismograph surveys. Indicate several important new oilfields in PERMIAN & PENNSYLVANIA ZONES. Oil Men & Investors who appreciate unbiased facts. Furnished details on these important areas gratis.

W. J. PETERMAN, Geologist
Portales, New Mexico

PRODUCTION WANTED

Transact Your

OIL BUSINESS

With An Experienced Contact

On GROUND FLOOR Basis of

Oil Investments

Drilling Proposals

A. S. BERRY

P.O. Box 1383 — 522 Wright Bldg.
Phone 5-5402, Tulsa, Okla.

FARMS

CATTLE RANCH

Near Vancouver, B. C. 1,000,000 Ac. 28,944 Ac. Deeded. 5000 Ac. Farm Land. Runs 5000 head. With more development would run 10,000 head. Highly Improved. Price $1,350,000, includes 3250 fine cattle, & all equipment, etc. Terms, or, will take good income property in exchange.

THIS IS A FINE TAX DEAL

For this & other Good Ranches.

LOYAL C. STAHL, JR.

630 Title & Tr. Bldg., Phoenix, Ariz.

ROYALTIES

PRODUCING ROYALTY and overrides for sale. Wire-write-call for particulars. JACK EAGLE, 706 City Natl. Bldg., Okla City, Okla. REgent 6-7027.

QUICK CASH: Producing royalties, Overrides or Production . . . no delay. Phone 72-4533, Robert L. Kinkaid . . . P.O. Box 26, Tulsa, Oklahoma.

PRODUCING royalty in undeveloped field, Newton County, Texas. 13.2 royalty acres under 567 acre lease. One oil well, one shut-in distillate well, two sands. $81.64 monthly average 5 months. Will sell all or half for $550 an acre. Also Louisiana producing royalty. C. B. Humphrey, Box 722, Jennings, La.

OFFERING ROYALTIES IN ELK CITY pool and its original trends. Opportunities for big profits in short time likely. A. S. Berry, P.O. Box 1383, Tulsa, Okla.

WE WILL buy producing or non-producing oil royalties. Standard Security Company, 111 Broadway, New York 6, N. Y.

ROYALTIES WANTED

Producing Royalties
High Grade Only
Send Full Particulars
Address

C. C. HARMON

719 World Bldg., Tulsa, Okla.
P.O. Box 2151

LEASE AND DRILLING BLOCKS

WANT $3000.00 for ½ rework 2 wells. Deep sand, flowed when pulled. 160 acres. Next section reworked 2 wells, recovered 20 thousand in 40 months. Money escrowed in bank. L. Price, Coweta, Okla.

DALLAM COUNTY, TEXAS: 8000 acres solid block one owner. ⅛ County leased to Major Companies. $1.25 bonus, $1.00 rentals, 10 year commercial lease. Combest Royalty Company, Amarillo, Texas.

WILL pay cash instantly for leases (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

DRILLING Deals. See A. L. Bowles, Rollow Bldg., Ada, Okla.

5000 ACRES-2800 acres GRAY COUNTY, TEXAS, Semi-proven oil and gas 3000'. Small cash bonus and little override. 5 year commercial lease $1.00 rentals. Combest Royalty Co., Amarillo, Texas.

1,000 ACRES in one lease—Illinois Basin. Depth approx. 2,100 ft. Devonian Prospect. Small production found in year 1911—today with application of acid, substantial production should be developed. Need capital to put in production. Address Box 245 or Phone 801, Mt. Carmel, Ill.

LOOKING FOR A LEASE? There will be over 40,000 wells drilled this year. If you are looking for a lease, drilling block, or drilling deal and haven't found it in this column, or if you have a lease or drilling block you want drilled, a Journal classified advertisement can find an interested party. See box heading for classified rates, or write The Oil and Gas Journal.

LEASES ROYALTIES

Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited

B. D. BUCKLEY

6635 Delmar Ave., St. Louis 5, Mo.

DRILLING PROPOSITIONS WANTED

Am ready to cut a few more holes. Will drill proven; semi-proven or wildcat. Submit complete information, including geology, if available. All propositions held strictly confidential. **Box G-376, The Oil and Gas Journal, Tulsa, Oklahoma.**

REAL ESTATE

COMMERCIAL Sites (100 x 235 ft.). Residential lots (75 x 140 ft.) on Highway 83 just north of Minot (restricted to new construction). L. A. Joyce, Box 575, Dial 37-127, Minot, North Dakota.

PRODUCTION FOR SALE

BY OWNER: Interest in 25 sand wells in Indiana—one pool. Average monthly income $1350.00; expense $50.00. Address Box 245 or Phone 801, Mt. Carmel, Ill.

GEOLOGISTS

GET MORE for our Oklahoma oil properties with a geological sales report. Box G-335, The Oil and Gas Journal, Tulsa, Okla.

WANTED

WANTED to purchase Petroleum statistical guide (Vance Rowe) monthly reports for Western Kansas—years 1941 through 1952 in good readable condition. Box G-360, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL PRODUCTION

FOR SALE: About 250 bbls. settled production with possibilities for a great increase. Box G-375, The Oil and Gas Journal, Tulsa, Oklahoma.

WILDCAT COMPLETIONS

(Continued from page 198)

INDIANA

Gibson County: J. D. Clouse 1 Daugherty, 12-1s-10w. Dry. TD 2,032 ft.
F. W. Meyer Jr. 1 Grubb, SE SE NE 3-2s-9w. Dry. TD 1,727 ft. Aux Vases 1,588 ft.
R. O. Wilson 1 Ward, SW SW NW 33-2s-11w. Dry. TD 2,462 ft. St. Genevieve 2,380 ft.
Parke County: D. Baysinger 1 Bedwell, SE SE NE 16-14n-6w. Dry. TD 1,200 ft. Devonian 1,086 ft.
Pike County: Graham Development Co. 1 McClure, NE NE NE 34-1s-8w. Dry. TD 1,402 ft.
Sullivan County: B. Hackbush 1 Orr, NW NW NW 25-9n-10w. Dry. TD 481 ft.
Bayer Petroleum Co. 3 Hopper, NW SE NE 20-7n-10w. Dry. TD 848 ft.
Bayer Petroleum 4 Hopper, SW SW NE 20-7n-10w. Dry. TD 858 ft.

KENTUCKY

Henderson County: Ashland Oil & Refining Co. 1 Powell, SE SW SW 13-O-22. Dry. TD 2,807 ft.
Muhlenberg County: J. C. Miller and Ashland 2 Ziegler Coal, NW NE NE 18-J-26. Dry. TD 2,491 ft.
Barron Kidd 1 Newman, SE NE SW 6-I-29. Dry. TD 1,975 ft.
Westfall Drilling Co. 1 Rust, NW SW NW 2-G-29. Dry. TD 1,084 ft.
Union County: J. D. Turner 1 Beavins, NE NE SW 12-O-19. Dry. TD 2,791 ft.

MICHIGAN

Isabella County: H. E. Walton 1 Oplinger, NE SW NW 20-15n-6w. Dry. TD 3,757 ft. in Dundee.
*Jackson County: Allied Investments, Inc. 1 Hubbard, SW SW SW 36-3s-3w. IPP 10 BOPD, Traverse 1,627 ft., pay 1,627-28 ft. TD 1,628 ft. (New pool).
Kent County: Leonard Oil, Inc. 1 Ward, SW SW NE 13-7n-10w. Dry. TD 2,350 ft. in Dundee.
Midland County: Mogul Oil Co. 1 Shady, SE SE NW 13-16n-2w. Dry. TD 4,040 ft. in Dundee.
Montcalm County: Smith Petroleum Co. 1 Bennett-Sahlbom, C NE 2-11n-9w. Dry. TD 1,381 ft. in Marshall.

WEST VIRGINIA

*Randolph County, Roaring Creek district: Seneca Oil & Gas Co. 1 West Virginia Coal & Coke Corp. (USCI & Mfg. Co. Tract) 643 M.c.f. gas daily, Bayard sand 2,214-2,218 ft. TD 4,311 ft.

ALABAMA

Lamar County: Otis D. Coston 1 Hankins, C NW NW 32-14s-14w. Dry. TD 3,316 ft. in Mississippian. Elev. 540 ft., Mississippian 1,890 ft., Millerella 2,488 ft., Carter sand 2,679 ft., Lewis sand 3,230 ft., Iowa 3,275 ft.

MISSISSIPPI

Monroe County: Zack Brooks 1 Benefield, SEc NE SE NW 32-15s-18w. Dry. TD 5,875 ft. in Mississippian Chester. Elev. 206 ft., Mississippian 4,327 ft., Millerella zone 4,760 ft., Carter sand 4,907 ft., Sanders 5,018 ft.
Wilkinson County: Gulf Refining Co. 25 Crosby, SW NW SE 42-4n-1e. Dry. TD 7,173 ft.

SOUTH LOUISIANA

Calcasieu Parish: Houston Oil Co. and American Republics Corp. 1 Lutcher-Moore, 6-8s-11w. Dry. TD 7,103 ft.
Evangeline Parish: W. A. Moncrief, Jr., 1 Steckler, 26-2s-1e. Dry. TD 10,223 ft.
St. Mary Parish: Cities Service Oil Co. 1 State - Lease 1807, USC&GS, Station "Bayou" area. Dry. TD 11,005 ft.

NORTH LOUISIANA

Concordia Parish: Barnett Serio et al 3 Concordia Bank & Trust Co., 30-8n-9e. Dry. TD 6,000 ft.
Union Parish: Sohio Petroleum Co. et al 1 Lindsey, C SW SW 16-21n-3w. Dry. TD 8,804 ft.

ARKANSAS

Nevada County: Lion Oil Co. et al 1 Silvey, C NE SE NW 14-14s-22w. Dry. TD 3,520 ft.
Union County: Victor C. Smith et al 1 Stephens, C SE SW NE 7-17s-14w. Dry. TD 6,198 ft.

OKLAHOMA

Comanche County: D. H. Bolin 1 Pfeiffer, NW SW SW 12-4n-12w. Dry. TD 1,148 ft.
Grant County: Russell Maguire 1 Holcomb, C SE SW 25-25n-7w. Dry. TD 6,570 ft. 2nd Wilcox 6,476 ft.
Kay County: K. A. Ellison and Mid-Continent Petroleum Corp. 1 Kratz, SE SE SW 28-29n-2w. Dry. TD 4,570 ft.
Lincoln County: Helmerich & Payne, Inc., 1 Cahill, NW NE NW 13-12n-4e. Dry. TD 4,737 ft.
Vierson & Cochran 1 Miles, NW NW SE 11-13n-5e. Dry. TD 4,997 ft.
Logan County: Russell Maguire and Continental and Fleet 1 Dobson, SE SE NW 17-17n-1e. Dry. TD 5,179 ft.
Love County: Burk Royalty 1 Gridley, SE SE NW 24-8s-1e. Dry. TD 7,520 ft.
McCurtain County: Tom Grey and Chas. Ware 1 Britt, SE SW SE SE 29-7s-23e. Dry. TD 345 ft.
Noble County: H. Waggoner 1 Haxton, NE NE SE 6-20n-1e. Dry. TD 5,320 ft.
Payne County: T. N. Berry and Mid-Continent 1 McQuain, SE SE NW 27-19n-1e. Dry. TD 5,120 ft.
Pontotoc County: W. A. Delaney, Jr., 1 Smith-Beck, SW NE NW 9-3n-6e. Dry. TD 2,868 ft.
Seminole County: Austin-Dunham et al 1 Minton, SE SW SW 24-6n-5e. Dry. TD 2,675 ft.
*E. P. Halliburton 1 Sarkeys, SW NE SE 34-7n-5e. IPP 75 BOPD, 38°, dolomite 4,060-80 ft. TD 4,310 ft.
Stephens County: Arthur Finston 1 Tusey, NW SW NW 25-1n-4w. Dry. TD 4,511 ft.
Tillman County: Mid-Continent Petroleum Corp. 1 Brunk, SE NW NE 16-1s-19w. Dry. TD 3,428 ft.
Woodward County: Carter Oil Co. 1 Wyckoff, C SE SE 4-20n-17w. Dry. TD 9,305 ft. Mississippian lime 9,203 ft.

KANSAS

Barton County: J. D. Morris 1 Cook, NW NW NW 24-19s-13w. Dry. TD 3,448 ft.
Schermerhorn 1 Bradley, NW NW SE 11-20s-14w. Dry. TD 3,575 ft.
Butler County: Rex & Morris 2 Frerking, NW SE NE 4-24s-5e. Dry. TD 2,487 ft.
*Comanche County: Barbara Oil 1 Robbins, SE NE NW 23-31s-16w. IP 6,000 M.c.f. daily, Mississippian 4,888-4,915 ft. TD 4,930 ft. (Opens Robbins Ranch pool).
Ellis County: Victor-Deep Rock 1 Braun, NE SE NE 13-14s-17w. Dry. TD 3,580 ft.
Ellsworth County: The Texas Co. 1 Hockman, SW NW SE 31-14s-9w. Dry. TD 3,584 ft.
Harvey County: Trans-Era 1 Gronau, SW SW NW 9-24s-1e. Dry. TD 3,655 ft.
McPherson County: Anschutz 1 Priddy, SE SE SE 12-18s-4w. Dry. TD 3,662 ft.
*Pawnee County: Westgate - Greenland 1 Smith, SE SE SW 22-22s-15w. IPP 2,822 BOPD, Arbuckle 3,960-80 ft. TD 4,013 ft. (New pool).
Rooks County: Salina 1 Kollman, SW SW NW 17-7s-18w. Dry. TD 3,566 ft.
Braden Drilling Co. 1 Mongeau, SE SE NW 21-9s-19w. Dry. TD 3,631 ft.
Russell County: Stearns 1 Woelk, SE SE SE 20-13s-13w. Dry. TD 3,426 ft.

NEBRASKA

Cheyenne County: Forest Oil Co. 1 Schuler, SE SW SE 32-17n-47w. Dry. TD 4,425 ft. "J" sand 4,315 ft.

NORTH DAKOTA

Bottineau County: Cardinal Drilling Co. 1 Oscar Brenden, C NW SE 11-163n-79w. Dry. TD 3,521 ft. Lodgepole 3,408 ft.
Pierce County: Phillips Petroleum Co. 1 Olivia Saude, C NW SE 19-158n-74w. Dry. TD 3,361 ft. Lodgepole 3,074 ft.

CALIFORNIA

* Kern County: Moriqui & A. J. West Jt. Operators 4 Anderson, SW NE 15-30s-21e. IP 412 BO 12 hours, ½-in. 37°, Oceanic sand 3,450-90 ft. TD 3,490 ft. (New field discovery in McKittrick area.)
R. S. Rheem, Opr. 81-A Kearney, 31-29s-29e. Dry. TD 5,986 ft.
Superior Oil Co. 9 Bankline et al, 19-26s-21e. Dry. TD 2,983 ft.
Tejon Hills Co. 1 Tejon Hills Jones, 5-29s-20e. Dry. TD 2,128 ft.
Los Angeles County: Standard Oil Co. 7-1 N. L. & F., 2-3n-17w. Dry. TD 9,327 ft.
E. T. Wix 1 Simmons, 20-3s-13w. Dry. TD 8,600 ft.
* Madera County: Tide Water Assoc. Oil Co. 1-20 Redman-Stone, SW NW 20-10s-14e. IP 7,000 M.c.f. daily, 40/64-in., 700 psi. tubing pressure, perforations 2,894-2,904 ft. TD 2,971 ft. (New lower Zilch zone and Southeast extension to Chowchilla field.)
Orange County: The Texas Co. 1 Irvine Ranch (NCT-2), 18-5s-8w. Dry. TD 4,997 ft.
San Luis Obispo County: C. R. North 1 Albert M. Bland, 9-28s-12e. Dry. TD 1,063 ft.
Ventura County: The Texas Co. 1 Hunter, 6-3n-18w. Dry. TD 10,150 ft.

MONTANA

Fallon County: W. M. & A. P. Fuller 1 NPRR, E½ NE NE 29-5n-60e. Dry. TD 9,308 ft. Red River 8,702 ft.

Liberty County: Anaconda Copper Mining Co. 3 Blair, C SW SW 14-34n-4e. Dry. TD 2,763 ft. Madison 2,693 ft.

McCone County: Shell Oil Co. NP 12-29 "C," C SW NW 29-22n-49e. Dry. TD 9,451 ft. Devonian 8,576 ft.

Richland County: Richey Oil Co. 1 Otis Waters, C NW NW 20-23n-51e. Dry. TD 7,565 ft. Mission Canyon 7,296 (?) ft.

Rosebud County: K. D. Owen 1 Rasque, C SE SW 14-10n-32e. Dry. TD 6,039 ft. Kibbey 5,887 ft.

Valley County: The California Co. 1 Government, C NE NW 33-26n-34e. Dry. TD 6,756 ft. Cambrian 6,730 ft.

WYOMING

Converse County: True, Brown & Fulton 1 Tank Farm, SW NW SE 34-34n-74w. Dry. TD 9,658 ft. Morrison 9,641 ft.

Washakie County: Woodward Oil Co. 1 Government, Ziegler, C NE NE SE 8-48n-90w. Dry. TD 1,909 ft. Tensleep 1,855 ft.

UTAH

Emery County: Anderson & Brockbank 1 McMullin, C SW 12-17s-9e (SLM). Dry. TD 1,700 ft.

Uintah County: Continental Oil Co. 1 McConkie et al, SW SW 16-4s-21e. Dry. TD 7,960 ft. Weber 7,860 ft. Complete as water well.

Gulf Oil Corp. 1 Southman Canyon, NE NE NW 14-10s-23e. Dry. TD 8,502 ft. Mancos 8,255 ft.

COLORADO

Logan County: McDannald Oil Co. 2 Veverka, SE SE SE 9-7n-54w. Dry. TD 5,200 ft.

Helmerich & Payne 1 Heard, NW NW NW 21-7n-54w. Dry. TD 5,290 ft. Skull Creek 5,233 ft.

Weld County: Falcon Seaboard 1 Federal, SE SE NE 8-9n-56w. Dry. TD 6,325 ft.

ARIZONA

Maricopa County: L. W. Landrum & T. R. Gabrielson 1 L&G, 14-5n-3e. Dry. TD 1,130 ft.

MANITOBA

Bailey Selburn 3-20 Boissevain, LSD 3, 20-3-19w1. Dry. TD 2,690 ft. Jefferson.

Western Homestead-Long Island 1 Birdtail, LSD 9, 21-15-27w1. Dry. TD 3,405 ft. Devonian.

LEGAL

Sealed bids on Oil and Gas leases on 33,990.85 acres of Tribal and Allotted Indian lands on the Fort Peck Indian Reservation, Valley and Roosevelt Counties, Montana, will be opened at 2:00 P.M., March 27, 1953, in the office of the Superintendent, Fort Peck Indian Agency, Poplar, Montana. Specific information in connection with this sale of leases may be had by letter or wire to James D. Crawford, Superintendent, Fort Peck Indian Agency, or by phoning 2181, Poplar, Montana.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT, Washington 25, D. C. Notice is hereby given that 120 acres of land in T. 21 N., R. 16 W., La. M., Louisiana, within the known geologic structure of the Caddo field, will be offered in one parcel for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre, at 1 p. m., Eastern Standard Time, April 8, 1953, when bids will be opened. Details of the lease offering, how and where to file bids and a description of the lands may be obtained by addressing an inquiry to this office. Marion Clawson, Director.

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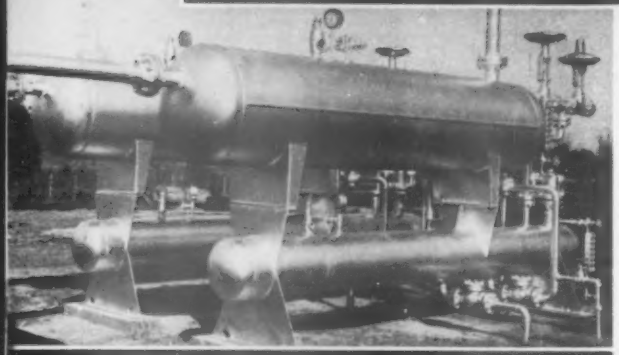
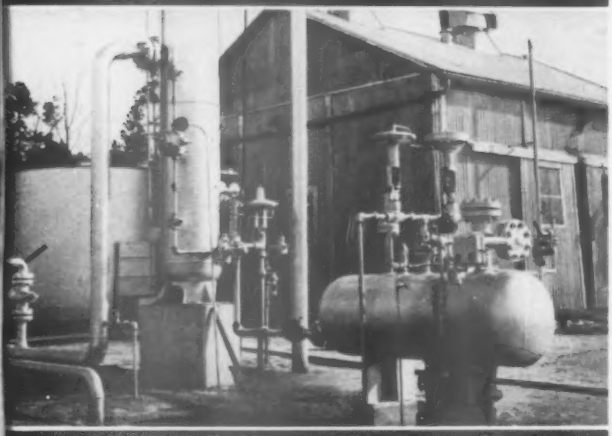
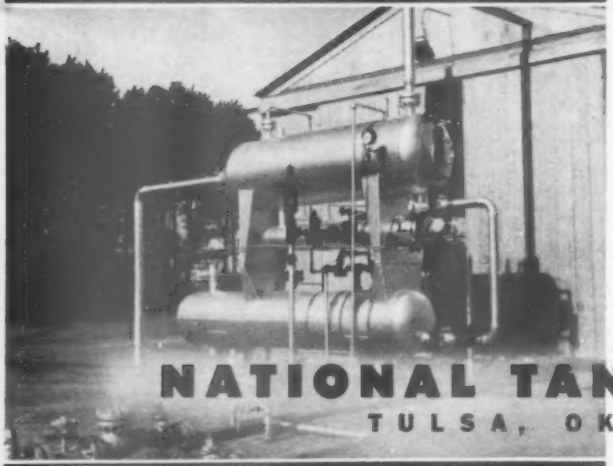
National
COMBINATION SEPARATOR & FLUID BOOSTER



2—30" 500 PSI Oil and Gas Separators with 16" 1200 PSI BOOSTERS. Compressing gas at this site from 350 PSI to 1100 PSI.

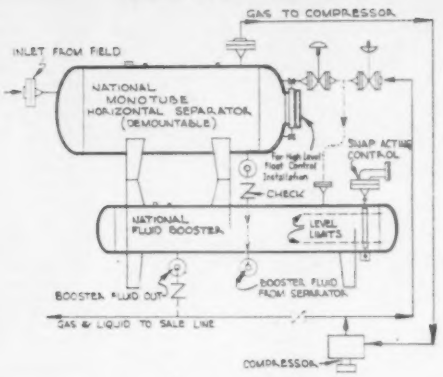


24" 1500 PSI Fluid Booster operating in conjunction with a vertical Oil and Gas Separator and Gas Compressor.



30" 1000 PSI Oil and Gas Separator with 10" Water Leg and 24" 1500 PSI BOOSTER. Fluid is boosted from 800 PSI line into 1350 PSI line.

(Patented and Patents Pending)



FLOW DIAGRAM

APPLICATION

Usual application is in producing areas where well head pressures have fallen to a less pressure than the existing gas sale line pressure. Here the unit is used in conjunction with a gas compressor.

Typical of this situation is the Carthage Field in East Texas which is supplying gas to a 1050 PSI transmission and gathering line whereas the field producing pressures have fallen to 400-600 PSI.

OPERATION

The fully automatic unit operates as follows: The well product enters the separator where gas is separated and scrubbed of any entrained liquid. The liquid flows to the booster and gas flows to a compressor. When fluid level builds up in the booster to a prescribed level, a snap acting control opens and closes simultaneously the two valves in the line from the discharge side of the compressor. No gas is vented when double valving is used. Pressure equalizes on the booster with that of the compressor outlet. The liquid then flows from the booster and is comingled with the gas downstream of the compressor and flows then into the sale line.

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TULSA, OKLAHOMA

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There are those among us who say a decline in government spending will bring depression. But where is there room for depression when we add the population of another Minnesota or an Iowa to our nation each year—when the need for goods and services increases steadily? In fact, only by tapering off our vast programs of government spending can industry and business hope to provide sufficient goods to maintain our present standard of living and satisfy the demands of our ever growing population.

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This continuing research enables Hughes to keep pace with the constantly changing needs of a fast moving drilling industry. Progress dictates that we can never be satisfied with any improvement of the moment.